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Relationship of Exhaust Emissions to Vehicle Miles in Car Surveillance Program

Ethyl Corp, Ferndale, Mich

Prepared for

National Air Pollution Control Administration, Ann Arbor, Mich Mobile Source Air Pollution

Sep 69

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Motor Vehicle Emission Lab
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RELATIONSHIP OF EXHAUST EMISSIONS TO VEHICLE MILES
IN
CAR SURVEILLANCE PROGRAM

for

U.S. Public Health Service

under

Contract No. CPA 22-69-12

by

Ethyl Corporation
Ferndale, Michigan 48220

Final Report
September, 1969

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I. PURPOSE

Drafting new legislation to restrict automotive emissions requires a comprehensive knowledge of emission levels in different communities. This knowledge should be based on the emission behavior of typical motorist-operated vehicles in different sections of the country. To obtain the necessary data, the U.S. Public Health Service (PHS) has been evaluating automotive exhaust emissions in several large cities since the summer of 1962. To determine the level of exhaust emissions from a large selection of popular-make cars, both with and without standard emission-control devices, the PHS awarded Contract No. PH 86-66-2 to Ethyl Corporation in 1966. That study was designed to determine the emission-reducing effectiveness of the control devices at various climatic and altitude conditions, plus how that effectiveness varies with use. In order to cover a broad range of conditions relating to atmospheric environment, the work was conducted on General Service Administration (GSA) cars in Minneapolis, Houston, Denver, and Phoenix. In addition, a similar program was carried out by the PHS automotive laboratory in Cincinnati on cars in that city. During the program, which covered one year of operation in each city, mileage accumulation averaged about 20,000 miles per vehicle.

Because mileage accumulation in the previous program was not considered sufficient to show the effect of vehicle usage on change in exhaust-emission levels, the PHS awarded Contract No. CPA 22-69-12 to Ethyl as an extension of the exhaust-emission surveillance program in August 1968, approximately one year after the termination of the original contract. By that time the test vehicles had accumulated about 40,000 miles

The conditions of the new contract were the same as in the original contract, except in the following particulars:

1. Work was to be limited to GSA vehicles in Cincinnati, Houston, and Phoenix.
2. Only cars with exhaust-emission control devices were to be tested.
3. Ethyl was to make the exhaust-emission analyses on the GSA cars in Cincinnati during both road route and Federal cycle operation. The contract did not include analyses of the Federal cycle data.

4. Ethyl was to analyse the data by a covariance type of statistical analysis relating the emission variables to the vehicle odometer miles. The results of this analysis were to be evaluated and a final report was to be prepared.

All other factors pertaining to the technological aspects of the work were to be the same as in the original Contract No. PH 86-66-2.

II. SUMMARY AND SCOPE

This report presents the results of a study whose major purpose was to define the relationships between exhaust emissions and accumulated vehicle mileage. The data used to derive these relationships include those obtained under the present contract (CPA 22-69-12), as well as some obtained under an earlier contract (PH 86-66-2).

Studies were carried out on Chevrolets, Fords and Plymouths, during three visits to five cities in 1967 on GSA vehicles with and without control devices. In the present contract, the study was limited to only those vehicles with devices in three of the cities--Houston, Phoenix, and Cincinnati. The emissions measured were HC-FID, HC-IR, CO, CO_2 and NO_x, on both a concentration and a weight basis.

All data were statistically analysed by a combination of regression and covariance techniques. The methodology and the mathematical model, which is linear in either miles or log miles, are discussed in detail.

For the data as a whole (involving three cities and three car makes, for a total of 90 cars each operated about 40 to 50 thousand miles), there is a small but statistically significant increase in emission level with mileage. Based on the average values for all the data obtained in the program, the concentration increases per 10,000 miles are 4.8% for HC-FID, 1.9% for HC-IR, 14.5% for CO, and 0.4% for NO_x. The corresponding average increases per 10,000 miles on a concentration basis are 175 ppm C for HC-FID, 57 ppm C for HC-IR, 0.23% for CO, and 8.5 ppm for NO_x. On a weight basis, the increases are 8.5% for HC-FID (0.00075 lb/mile), 5.1% for HC-IR (0.00023 lb/mile), 19% for CO (0.0148 lb/mile), and 5.1% for NO_x (0.00047 lb/mile).

The effect of mileage is quite different for the three car makes (Table 10). As mileage increases, the Plymouths show increases of about 10% in FID-HC concentration, but a very small decrease in NO_x. The other two makes show smaller increases in hydrocarbons and larger increases in NO_x

It should be noted that the average emission level is quite different for each make (Table 8), with the Chevrolets averaging about 70 to 80% as much hydrocarbons and NO_x as the Fords and Plymouths, which are quite close together in average emission levels.

64

All of the data are highly variable, with standard errors ranging from 18 to 51% of the overall averages (Table 9). In spite of this, statistical conclusions were possible because of the very large number of data points involved.

In addition to the government-owned vehicles, four cars supplied and maintained by Ethyl Corporation were also studied, as controls. Thus cars (two Fords and two Plymouths) showed about the same variability as the GSA cars. However the effect of mileage could not be established with statistical significance. If there was an effect, it was masked by the inherent high variability of the data.

III. PRELIMINARY OPERATIONS

The multicity emission-surveillance programs required development of a mobile laboratory to house all the electronic apparatus for making exhaust-gas analyses and engine inspection tests. In developing such a laboratory outside of contract costs, we used a 26-foot Airstream trailer. Figure 1 shows a photograph of the laboratory, and Figure 2 shows a layout of the interior equipment.

To ensure meeting the schedule for work in each city, we elected to supply the mobile laboratory with duplicate equipment where prior experience indicated the likelihood of instrument failure. This permitted repair of an instrument without discontinuing contract work.

All delicate instrumentation was cushioned and secured to prevent damage in transit. All other equipment and parts were made immobile. This procedure prevented injury to instrumentation during about 30,000 miles of operation of the mobile laboratory. Even when the laboratory accidentally overturned on the highway, damage to the instruments was negligible.

On arrival at each city where emissions tests were conducted, the mobile laboratory and its equipment in it were readied for use. The procedure followed is detailed in Appendix I.

IV. PROCUREMENT OF EMISSION DATA

Procuring the exhaust-emission data involved obtaining samples from the tailpipe of typical cars operated over a representative traffic route in several cities at different seasons of the year. Details concerning sample procurement are:

1. Test Schedule -- Two schedules were followed in making the exhaust-emission studies: (1) an intercity schedule and (2) an intracity schedule. The intercity schedule required doing the work in each city in a specified time period. This was necessary in order to ensure having the desired range of temperature and humidity and to hold those conditions reasonably constant in repeated visits to the same city. The intercity schedule and ambient test conditions for the three cities were as follows:

FIGURE 1

PHOTOGRAPH OF MOBILE TRAILER

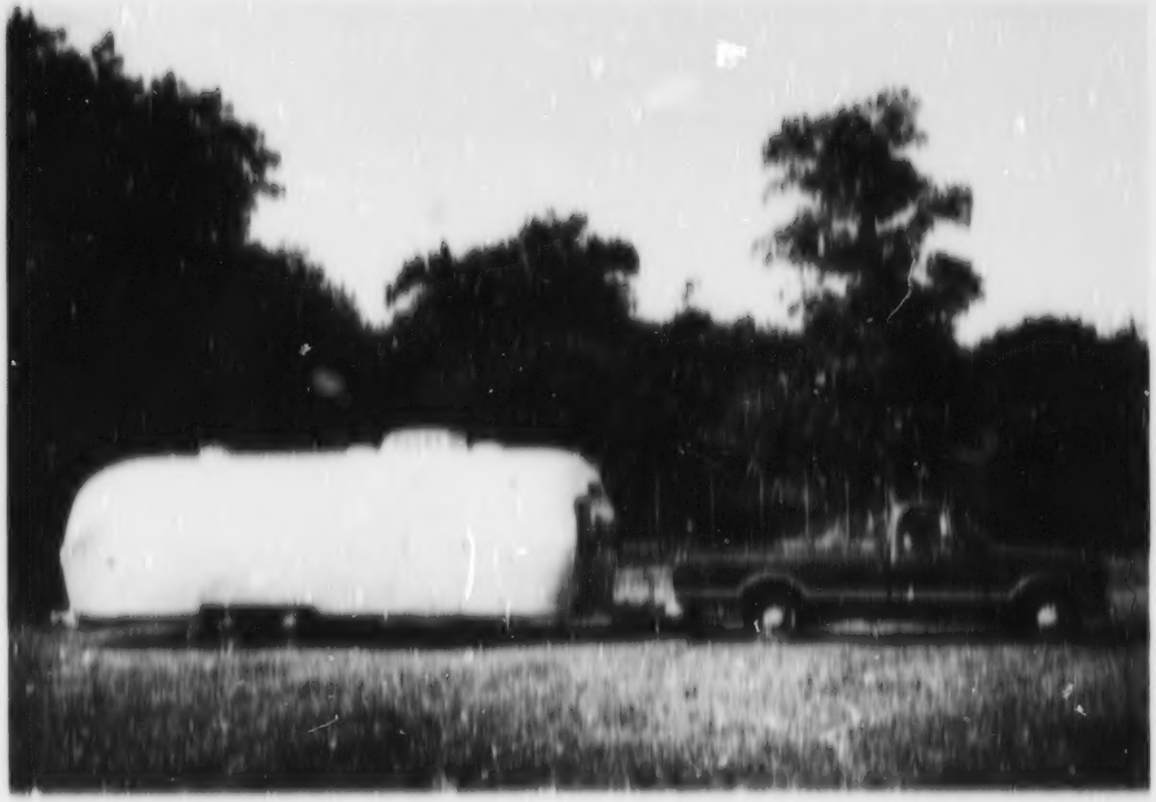
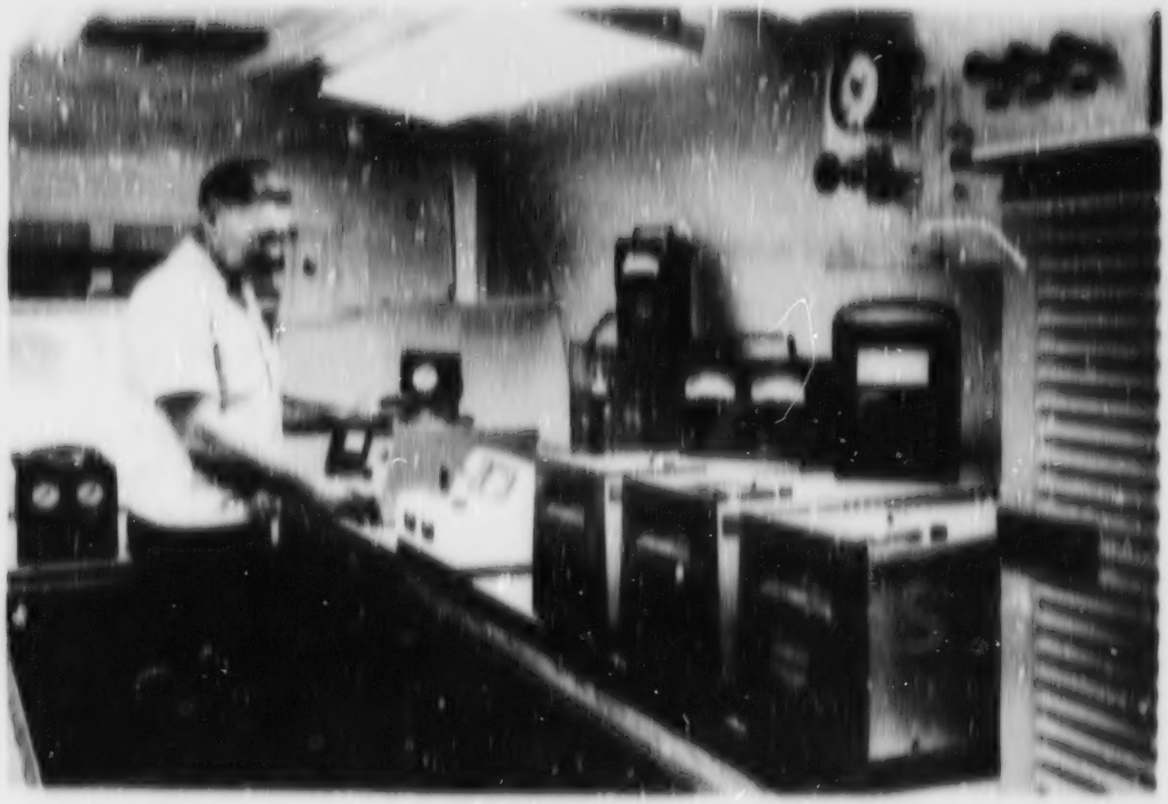


FIGURE 2

PHOTOGRAPH OF INTERIOR OF MOBILE TRAILER



	Cincinnati	Houston	Phoenix
Altitude, Feet (approx.)	600	50	2000
First Series			
Starting Date	3/8/66	2/28/66	5/3/66
Temperature, °F	61	65	88
Rel. Humidity, %	55	60	20
Second Series			
Starting Date	9/7/66	8/22/66	10/25/66
Temperature, °F	65	85	75
Rel. Humidity, %	60	68	32
Third Series			
Starting Date	3/9/67	2/21/67	4/28/67
Temperature, °F	61	60	78
Rel. Humidity, %	55	51	17
Fourth Series			
Starting Date	9/25/68	3/4/69	11/12/69
Temperature, °F	70	53	61
Rel. Humidity, %	55	60	67

Tests in each city were conducted over approximately a three-week period. The temperatures and humidities indicated in the above table are the average values over this period during the hours of the road tests. Atmospheric temperatures on return visits were reasonably the same except in two cases. In Houston during the second visit, the temperature was about 25°F higher than in the other visits. And in Phoenix during the fourth visit, the temperature was lower by about 20°F and the humidity was higher by about 40%.

The intracity schedule concerns the daily work task in sample procurement. In this schedule, specific efforts were made to carry out the work in such a way as to randomize conditions with regard to car makes, traffic patterns, weather, and drivers.

The test schedule required that replicate tests be completed on four cars each day. This required running two cars before noon and two cars in the afternoon. The schedule permitted making the road tests after the morning rush hours and before the evening rush hours, at times when traffic conditions are more stable and reproducible. Likewise, atmospheric conditions are generally more constant during the middle portion of the day.

Replicate tests were made with an interchange of drivers when practical in order to reduce the effect of specific driver operating patterns on the results. Depending upon car availability for tests, vehicles of different makes were tested in a random order.

B. Test Cars -- All cars were new 1966 models purchased specifically for this project. Cars with control devices were required in the State of California, but were not generally available from local dealers in some of the cities involved in this program. Consequently, the GSA procured these cars directly from the different manufacturers. However, the vehicles thus obtained were production-line factory products. The Ethyl vehicles, likewise, were purchased in Detroit through local factory outlets.

The vehicles were chosen to reflect the different control device techniques employed by the three major automobile manufacturers and to represent the engines and transmissions having the highest national production. These considerations led to the following choices:

Manufacturer	Model	Engine	Transmission
General Motors Corporation	Chevelle	283 cu. in. V-8	Automatic
Ford Motor Company	Fairlane	289 cu. in. V-8	"
Chrysler Motors	Belvedere	273 cu. in. V-8	"

It was intended that the vehicles be tested at all times in the "as is" condition, except for routine inspections and checks made by the GSA in its service program. Because the cars were used by personnel for long trips and over extended periods of time, those checks were not always made. Ethyl cars were maintained in good running condition at all times.

During the field tests in each city, Ethyl mechanics inspected each test vehicle but made no adjustments, except as noted below. These inspections covered the following items: Basic ignition timing, dwell angle, idle vacuum, idle speed, idle air-fuel ratio, vacuum switch valve operation (if used), flow through positive crankcase valve, heat valve operation, compression pressure of each cylinder, spark plug condition by oscilloscope inspection under load, and a check on driveability of the vehicle. In the initial series of tests, the ignition distributor was removed for measurement of centrifugal and vacuum advance. In later tests, these inspections were not required. The inspection data were recorded on special data sheets and transcribed to IBM punch cards. The procedure for making car inspections is detailed in Appendix II.

When vehicle inspections were first made on cars with devices, many were found to have ignition settings outside the manufacturer's limits. This happened because the vehicles were purchased directly from the manufacturer and not from dealers, who normally make this adjustment before the car is sold. Thus, it was decided to reset the ignition to the nearest specified manufacturer's limit.

As a general rule, further repairs and adjustments were allowed if any discrepancy from good vehicle maintenance was detected visually (without using any tools) by opening the hood. This would include reconnecting spark plug wires which have become disconnected and replacing broken fan belts. It would not include adjusting or cleaning the choke, manifold heat valves, etc. unless they prevented starting the vehicle. Broken spark plugs were replaced when removed for engine compression tests.

In all vehicle tests, the exhaust system was inspected for leaks. If leaks were found, the required repairs were made. This was done to insure good exhaust-gas samples, and it did not affect the performance of the vehicle with regard to the amount of pollutants exhausted.

3. Test Fuels -- Tests in Houston and Phoenix (as well as Minneapolis and Denver) were conducted with the fuel in the car tank. Thus, this test program provides no knowledge of the variability of fuels from car-to-car or from city-to-city. This approach was considered appropriate for the overall program objective; namely, determining the level of exhaust emissions from cars operated by the general public in a normal, representative manner. In the Cincinnati tests, the cars were operated on Indolene during the road route and Federal cycle operation. That fuel is described in Table 1.

TABLE 1

INDOLENE - FUEL INSPECTION

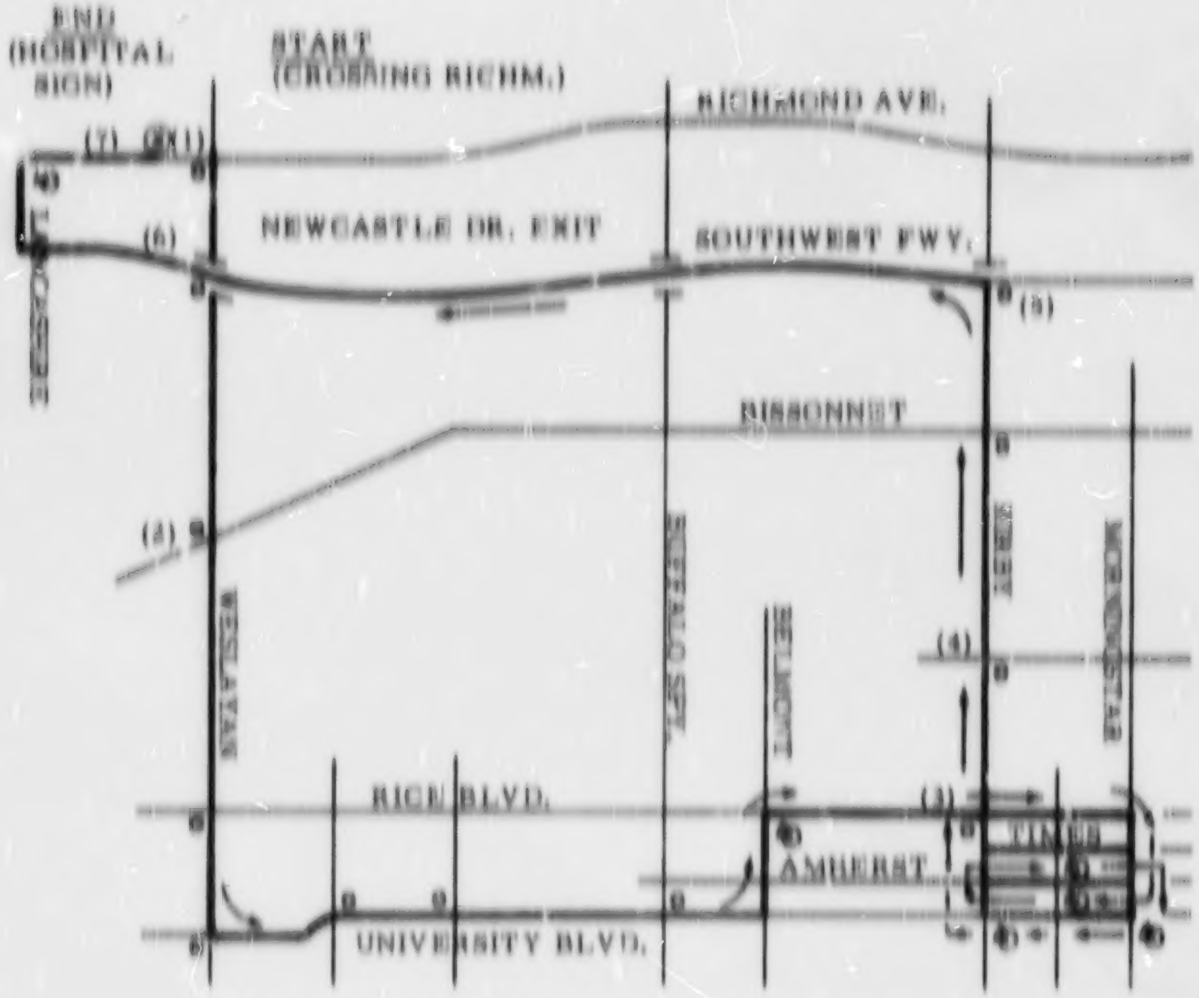
Paraffins and Naphthenes, %	61.2
Olefins, %	12.6
Aromatics, %	26.2
Research Octane No.	100.0
Motor Octane No.	88.8
Reid Vapor Pressure, psi	9.1
Percent off at 158°F	25.5
Gravity, °API	59.6
Distillation, °F	
Initial	90
10%	122
50%	208
90%	299
Maximum	398
Sulfur, % by weight	0.04
Tetraethyllead, ml/gal	1.28
Stability, min	600+
Gum, mg	3

4. Test Route -- In each city a route approximately eight miles long was developed to include business, residential, arterial, and limited-access driving in proportions such that the average speed was close to 25 miles/hr. The specific routes developed in each of the three cities are charted in Figures 3, 4 and 5. In a few instances, a minor change was made in a route upon a return visit to a city because of road repairs on the original route.

A definite attempt was made to select routes in the several cities that were similar with regard to traffic conditions. As the program progressed, however, it became apparent that the traffic flow patterns from city-to-city were notably different.

FIGURE 5

HOUSTON TEST ROUTE

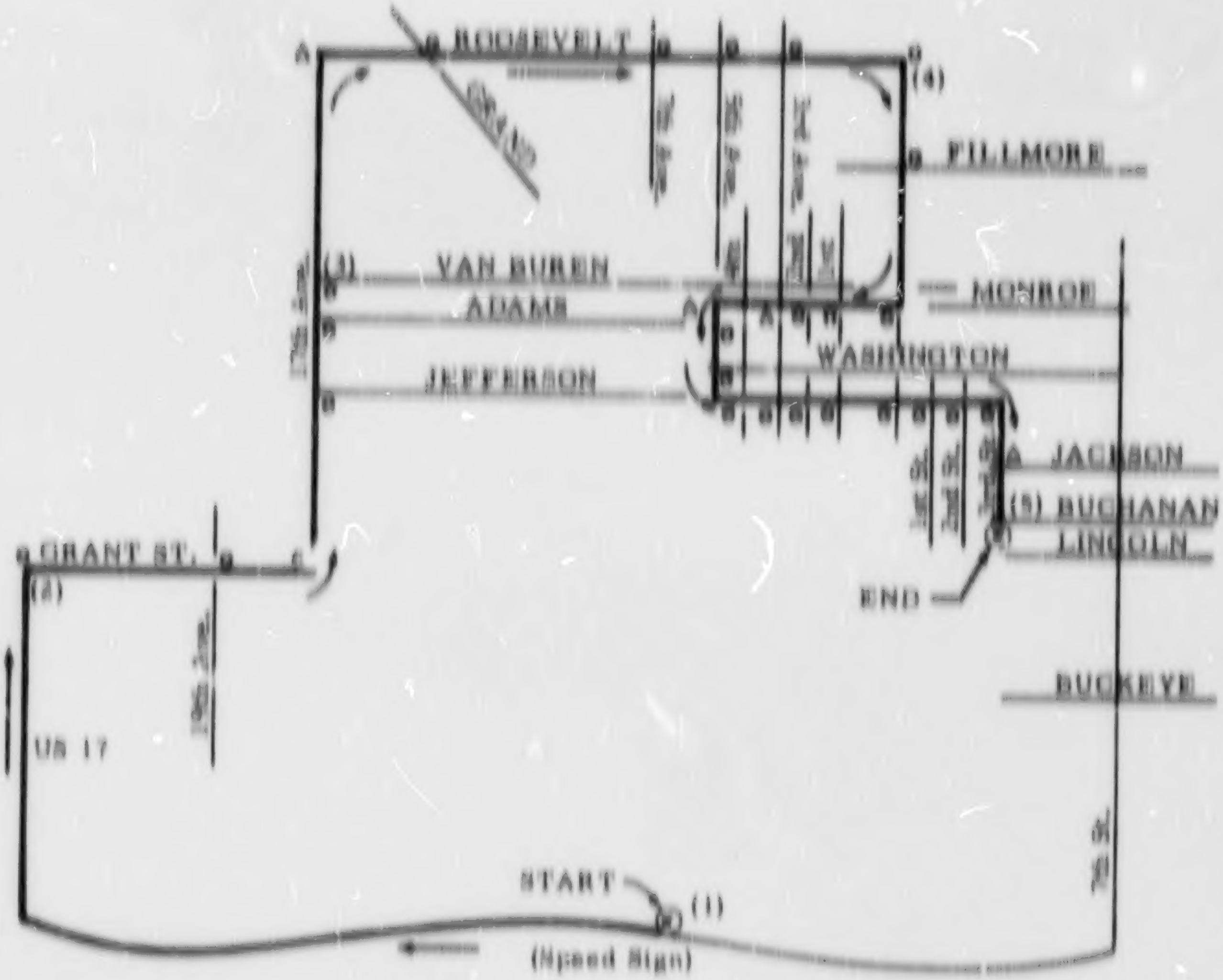

END
(HOSPITAL
SIGN)
START
(CROSSING RICHM.)
RICHMOND AVE.
(7)
(1)
NEWCASTLE DR. EXIT
(6)
SOUTHWEST FWY.
(5)
NEWCASTLE
BISSONNET
(2)
WESLAYAN
BUFFALO SPY.
KIRBY
(4)
RICE BLVD.
(3)
TIMES
AMHERST
UNIVERSITY BLVD.

A B

LOCATION	TYPE	MILES	STOP SIGNS	STOP LIGHTS
3 - 4	BUSINESS	1.9	4	2
2 - 3 + 6 - 7	RESIDENTIAL	2.2	0	1
1 - 2 + 4 - 5	ARTERIAL	1.9	1	9
5 - 6	FREEWAY	2.0	0	0
		8.0	5	12

FIGURE 5

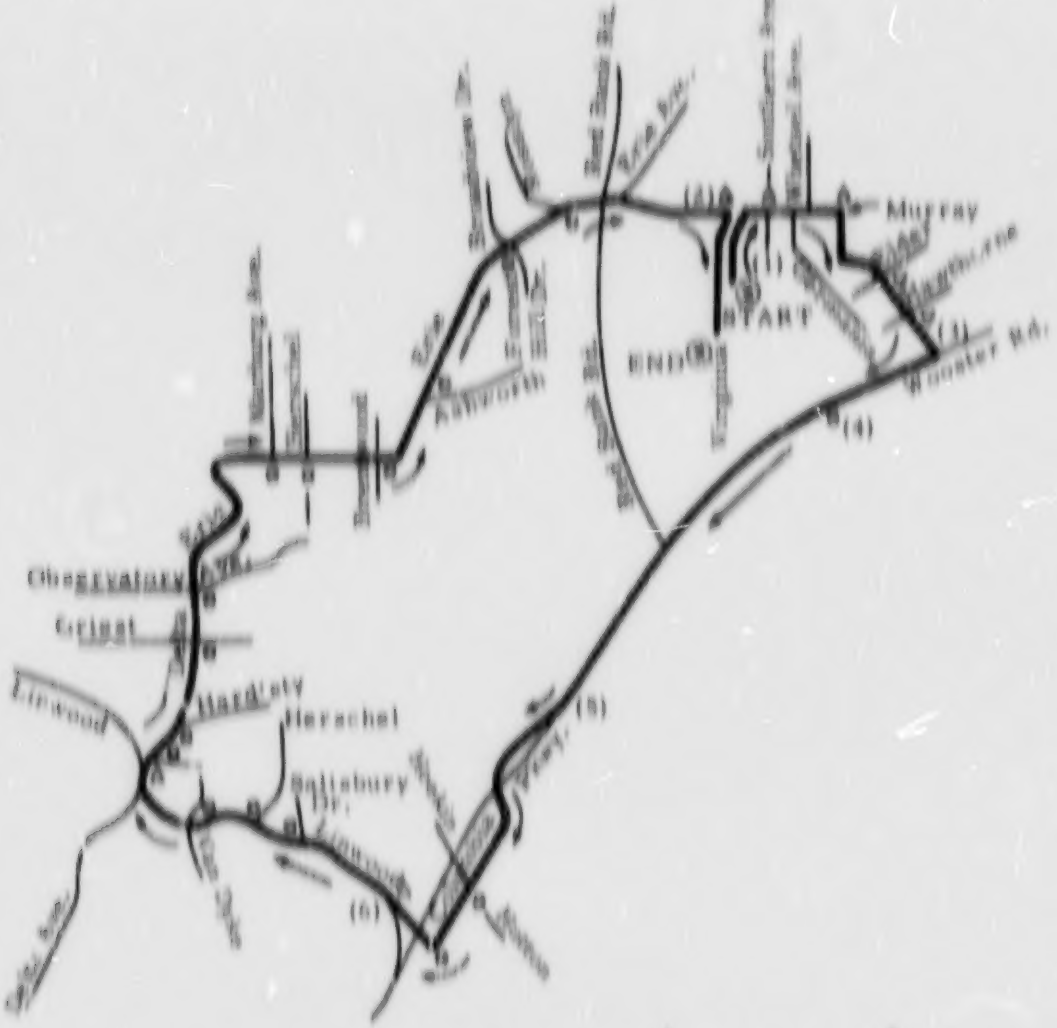
PHOENIX TEST ROUTE


ROOSEVELT
GRAND
(4)
FILLMORE
(3)
VAN BUREN
ADAMS
JEFFERSON
MONROE
WASHINGTON
JACKSON
(5) BUCHANAN
LINCOLN
END
GRANT ST.
(2)
BUCKEYE
US 17
START
(1)
(Speed Sign)

LOCATION	TYPE	MILES	▲ STOP SIGNS	⊗ STOP LIGHTS
1 - 2	FREEWAY	2,5	0	1
2 - 3	ARTERIAL	1,6	0	5
3 - 4	RESIDENTIAL	1,8	1	5
4 - 5	BUSINESS	2,1	3	14
		8,0	4	25

FIGURE 5

CINCINNATI TEST ROUTE


Murray
START
END
(1)
(2)
(3)
(4)
(5)
(6)
Wooster Rd.
Ashworth
Erie
Erie Ave.
Observatory Ave.
Grigst
Hardisty
Herschel
Salisbury Dr.
Linwood
Pkwy.

LOCATION	TYPE	MILES	STOP SIGNS	STOP LIGHTS
1 - 2 + 7 - 1	BUSINESS	0.8	1	0
2 - 3 + 4 - 5	RESIDENTIAL	4.1	5	3
6 - 7	ARTERIAL	1.3	2	14
4 - 5	FREEWAY	1.3	0	0
	TOTAL	7.5	8	17

5. Exhaust-Sampling Procedure and Equipment -- All road exhaust-gas sampling was done with the vehicle in the hot-start condition. One end of a 1/4-inch outside diameter stainless steel tube was inserted about 18 inches into the vehicle tail pipe. The other end of the pipe was brought inside the car body and attached to an ice trap for removal of the water in the exhaust-gas stream before it entered the proportional-sampler equipment.

This sampler, developed by PHS and manufactured by Pace Engineering Company, is an electromechanical servo device that obtains a composite exhaust sample proportional to the engine carburetor air flow under all operating conditions. Recording, flow integrating circuits built into the sampler provide measurements of both total sample flow and total exhaust flow necessary for calculations of contaminant concentrations as both parts per million and pounds per vehicle mile. Since both total sample volume and total exhaust volume were obtained, the proportionality of the sampler could be checked. Tests that showed a deviation in proportionality of more than three percent were rerun.

Detailed instructions on calibration, checkout, and sampling procedure with the proportional sampler are given in Appendix III.

6. Analytical Procedures -- After the selected test course had been driven and an exhaust-gas sample had been collected in the proportional sampler bag, the vehicle was immediately driven to the mobile laboratory unit. The sample was extracted from the proportional sampler bag and put into another bag previously evacuated. This second bag, now containing the sample, was connected to the analytical train, and analyses were made for HC-IR, HC-FID, CO_2, CO, O_2, and NO_x. The elapsed time from initial sample procurement to analysis was about 45 minutes. Reactions among the exhaust-gas components during this time were minimized by dilution of the sample with about three parts nitrogen and retention of the sample in a Tedlar plastic bag. The procedure for making these analyses is detailed in Appendix IV.

Any runs that were obviously in error were repeated until two satisfactory tests were obtained. One general rule for discarding a run was that the two acceptable runs should agree within 20% on HC-IR measurements. Other factors, such as a big deviation in average vehicle speed over the route or poor agreement between carburetor and sampler integrator counts, could also disqualify a run.

V. DATA RECORDING AND HANDLING

Based on the original car surveillance program (covering three series of tests in four cities on 20 cars each of three makes, 10 with exhaust control devices and 10 without), it was apparent that the mass of data collected for six exhaust-emission measurements on a concentration basis and on a mass basis would be very large. The obvious approach was to record and handle the observed data in such a way that the necessary computations and data retrieval could be done with the aid of an electronic digital computer.

To facilitate the computer approach, all original data were recorded on a form sheet similar to an 80-column FORTRAN keypunch sheet. Each sheet was assigned a Serial Run No. and a Run Code No. The Serial Run No. was useful for visual identification of runs, while the Run Code No. was used in handling and retrieving the data in computer operations.

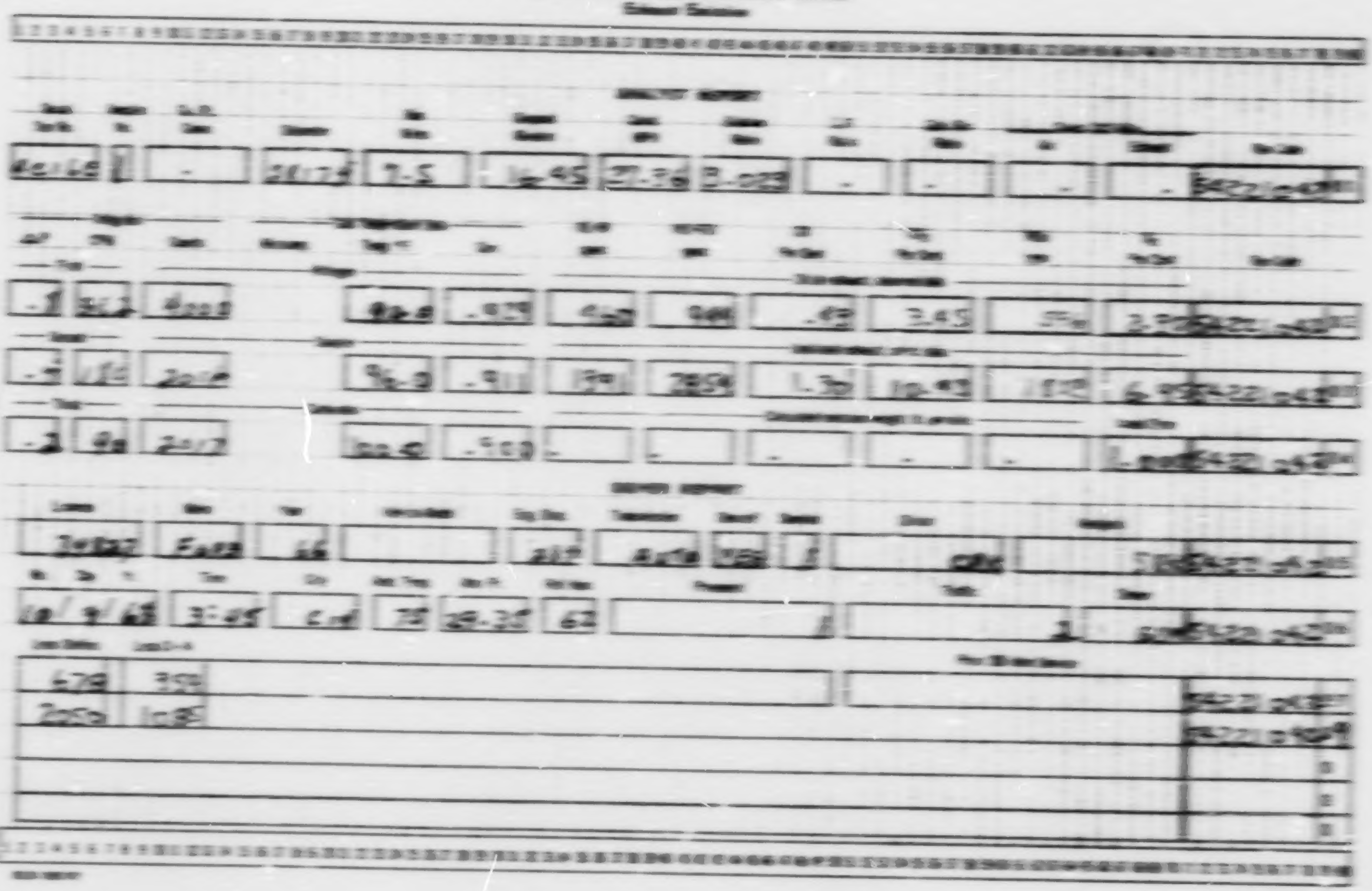
To record all observed data, two data sheets were required: (1) an analyst report and driver report and (2) engine inspection checks and OSA inspection data. Typical examples of these data sheets are shown in Figures 6 and 7. The code information on the back of Figure 6 is shown in Figure 8, and the code on the back of Figure 7 is shown in Figure 9.

In the field, sufficient hand calculations were made to assure the group supervisor that satisfactory data had been obtained, as previously outlined. Data sheets were made out in triplicate with one sheet sent to the PHS, one to Ethyl, and one retained in the mobile laboratory. The information on the data sheets received at Ethyl was key-punched, verified, and processed by a special computer program to do all the calculations from the basic observations made in the field. The output from this program was a data summary sheet containing all the original data plus emission calculations for concentrations of pollutants on both a concentration and a weight basis. Copies of these data summary sheets were sent to PHS after completion of work in city, and they are a part of this report.

An example of the data summary sheet for the data shown in Figure 6 is shown in Figure 10. Vehicle inspection of the type shown in Figure 7 was key-punched and a card deck for each test vehicle was sent to the PHS, in accordance with contract specifications.

An item of interest in Figure 10 is the CO/CO_2 scaled values for data on a parts per million basis. The cars with air-pump devices in the exhaust

FIGURE 5 — PUBLIC HEALTH SERVICE SURVEILLANCE



[illegible] – PUBLIC HEALTH SERVICE SURVEILLANCE

[illegible]

FIGURE 8

Col. 71 City
  - 1 Denver-Road
  - 2 Houston-Road
  - 3 Minneapolis-Road
  - 4 Phoenix-Road
  - 5 Cincinnati-Road
  - 6 Cincinnati-Dyn.

Col. 72 Visit to City, 1, 2, 3...9

Col. 73 Exhaust Control Device
  - 1 No Device
  - 2 Device on Vehicle

Col. 74 Car Make
  - 1 Chevrolet
  - 2 Ford
  - 3 Plymouth

Col. 75 Sampler No. 1, 2, 3...8
(Car Status Run Code, Use 9)

Col. 76-77 Car Number in Set. 11, 12, 13...99

Col. 78 Test Run Per Car, 1, 2, 3...8
(Car Status Run Code, Use 9)

Col. 79 Special Card Code
  - 0 Exhaust Emission Cards
  - 1 Car Status Cards

Col. 80 As Shown on Run Sheet

Col. 1 Visits to City, 1, 2, 3...9

Col. 2 City
  - D Denver
  - H Houston
  - M Minneapolis
  - P Phoenix
  - C Cincinnati

Col. 3,4 Chronological Run No., 01, 02, 03...99

Col. 5 Report Sheet
  - A Car Status
  - B Exhaust Emission, 1st Run on Car
  - C Exhaust Emission, 2nd Run on Car
  - D Exhaust Emission, 3rd Run on Car

  - T Exhaust Emission, 1st Run on Dyn.
  - U Exhaust Emission, 2nd Run on Dyn.
  - V Exhaust Emission, 3rd Run on Dyn.

FIGURE 2

KEY IDENTIFICATION

START CHECK

1 Starts in first few revolutions
2 Starts after long cranking
3 Starts after pumping foot pedal
4 Starts after mechanical adjustment

VACUUM SWITCH VALVE

1 Operating normally
2 Marginal
3 Not operating

HEAT VALVE

1 Completely free
2 Binding slightly
3 Immobilized

DRIVE CHECK

1 No malfunctioning
2 Slight occasional hesitation
3 Definite misfiring
4 Car stalls frequently

SPARK CONDITION

1 Normal hi-voltage discharge
2 Occasional slight abnormality
3 Definitely abnormal
4 Not firing

EXPLANATIONS

IGNITION TIMING

All values crankangle degrees
+ Values are after top center
- Values are before top center

CAR INFORMATION

No. is the total number of times
item was checked.
Odometer is miles at last check.

FIGURE 10

```
                    PUBLIC HEALTH SERVICE
           EXHAUST EMISSION SURVEILLANCE CONTRACT

SUMMARY FOR RUN  4C168                           ODOMETER          28166
                                   GAS TEMP.     OBS.  MILES       7.900
CITY        CIN ROAD               :::::::::     OBS.  MINUTES     17.41
VISIT        4              COUNT  DEG. CORR.    CALC. MILES/HR    25.25
DEVICE      A.I.R.                               COUNT RATIO       0.999
CAR MAKE    FORD       NITR  4001  90. 0.929     AVE. COUNTS/MIN   180.8
FLOW ELEM.   1         SAMP  2021  90. 0.929     CUB. FT./COUNT    0.369
CAR NUMBER   4         CARB  2024  90. 0.929     SCF AIR/MILE       88.1

FIRST  RUN ON THIS CAR                           LICENSE NO.       34827

                   FROM NITROGEN COUNTS          FROM CO/CO2 CALCN.

AMBIENT CONDITIONS                                AIR/FUEL RATIO  13.77
                    DILUTION RATIO  2.980         DILUTION RATIO  3.927
TEMP.        76 F                                 EXH/AIR  RATIO  0.947
PRESSURE 29.38 IN.                                SCF EXH/MILE     83.4
HUMIDITY     64 PCT                               MILES/GALLON     17.2


                   ....NITROGEN SCALED....      .....CO/CO2 SCALED.....
EFFLUENT  DILUTE   UNDILUTED  EMISSION WT.     UNDILUTED  EMISSION WT.
          EXHAUST   EXHAUST     LB/MILE         EXHAUST     LB/MILE

HC NDIR   475 PPMC  1415 PPMC   0.0042          1865 PPMC

HC FID
TOTAL     964 PPMC  2872 PPMC   0.0086          3786 PPMC
 OLEFINS  259 PPMC   772 PPMC   0.0023          1017 PPMC
 AROMAT.  286 PPMC   852 PPMC   0.0026          1123 PPMC
 PARAFS.  419 PPMC  1248 PPMC   0.0037          1645 PPMC

NOX       542 PPM   1615 PPM    0.0161          2129 PPM

CO       0.43 PCT   1.28 PCT    0.0777          1.69 PCT
CO2      3.40 PCT  10.13 PCT    0.4656         13.35 PCT
O2       2.40 PCT   7.15 PCT


  34827  FORD 1966               289   AUTO YES  1        CRK        SRK
10/09/68  3019   CIN  76 29.38  64                1               2   GSA
  705   419
 2101  1249
```

system obviously dilute the exhaust gases with air. This causes an apparent reduction in pollutant concentration when the gases are analyzed in the conventional manner. This situation makes it impossible to compare emission concentration levels for cars operating with and without these devices.

To establish emission concentration data on a comparable basis, corrections were made for dilution in those cars equipped with air pumps and for inadvertent leakage in the exhaust or sampling systems. This was done by adjusting the gas concentration back to the basic engine air-fuel ratio, using the technique based on carbon monoxide-to-carbon dioxide ratio.

This adjustment is possible because the ratio of carbon monoxide to carbon dioxide is, for practical purposes, the same in the bag samples as it is in the exhaust, regardless of dilution and the extremely minor effect of carbon dioxide in the dilution air. This is true whether the dilution is affected by the amount of dry nitrogen used in the proportional sampler, by exhaust or sample line leakage, or by excess air introduced into the exhaust system with an air pump. Moreover, since the carbon monoxide-to-carbon dioxide ratio is determined by the air-fuel ratio of the engine and since, at any given air-fuel ratio, there can exist only one concentration of carbon dioxide in the undiluted exhaust, it follows that the undiluted carbon dioxide concentration can be determined by the ratio of carbon monoxide to carbon dioxide in the exhaust sample. When this undiluted carbon dioxide concentration is compared with the measured carbon dioxide concentration in the exhaust sample, an overall dilution ratio is obtained. This ratio can then be applied to all the pollutants to obtain concentrations adjusted for dilution. All concentration data for all pollutants presented in this report have been so adjusted.

We recognize that this method of adjusting concentrations does not yield dilution corrections that exactly describe the composition of the exhaust gas at the engine exhaust ports. This is due to small differences in combustion equilibriums between combustion chambers and subsequent partial burning, with injected air, in the exhaust system. In any case, this adjustment provides the best available correction for dilution.

It should be noted that this correction is not necessary in calculating mass emissions; all mass emission data presented in this report are calculated from measured concentrations and flow measurements.

Details concerning the method of making these air-dilution adjustments, based on observed values for CO/CO_2, are given in Methods of Computation of

Data from Exhaust Emissions Surveillance Program prepared for the U.S. Public Health Service under Contract No. PH 86-66-2, June 1966 (Ethyl Corp. Report GR 66-27). This publication also details all the computer operations involved in the printout of the data summary tables such as shown in Figure 10.

VI. COMPUTER PROGRAM FOR ANALYZING DATA

1. Processing of Raw Data

The raw data from the tests were tabulated on standard forms and keypunched on cards. These were processed by an IBM 360 computer program named TRAILER which was similar in purpose and structure to the IBM 1620 program TRAILER (see Ethyl Corporation Report GR 66-27, pp 14-32) used for processing the same type of data in the previous contract. The two programs differ in many ways since the IBM 360 version permits storage of all primary and calculated data on a disk file. The variables stored with their serial numbers are given in Table 2. For convenience in handling, all of the previous data obtained in Rounds 1, 2 and 3 were stored, including the values for cars without emission-control devices. Selected groups of the stored data could be retrieved at will using computer program SELECT. Both programs are listed in Appendix 5. They are extensively annotated for easy reference and modification.

A selection of the data stored on the disk using program SELECT is given in Appendix 6 with averages for each city-visit-car make combination. The variables shown are odometer miles, air/fuel ratio, ambient air temperature, relative humidity, carburetor temperature, and HC-FID, CO and NO_x on concentration and weight bases. The record numbers shown at the far left are used as cross-referencing identification numbers in the listings of observed values, calculated values and deviations that were sent in separately as part of the program.

Further processing of the data was carried out using Ethyl Corporation's proprietary linear least-squares regression program for the IBM 360 Model 30 with 32 K core; this program is named DELS (Detroit Ethyl Least Squares) and includes recalculations with "adjusted" values of variates in an internal two-pass procedure. Program SELECT stores 41 variables into a "DELS disk file" ready for further processing. The list shows the variables with their serial numbers (Table 3). The first eight are the "dummy" variables described in detail in a following section. Variables 21 and 22 are differences of the A/F ratio from 14.15 (a reasonable value near the stoichiometric point), which permit the calculation of pairs of intersecting straight lines. (These variables were not used in this contract.) All logarithms are to base 10.

TABLE 2

VARIABLES STORED ON DISK BY PROGRAM ''TRAILER''

1	RUN NO.	46	T AMB
2	SAMPLER	47	P AMB
3	CU FT/CT	48	HUMIDITY
4	DOOR	49	C EX/AIR
5	MILES	50	C SCF EX
6	MINUTES	51	CE HC IR
7	CALC MPH	52	CE HC FI
8	N DILRAT	53	CE CO
9	C A/F	54	CE CO2
10	N EX/AIR	55	CE NOX
11	SCF AIR	56	CTS/MIN
12	SCFEX IN	57	CW HC IR
13	DELTA P1	58	CW HC FI
14	CPM 1	59	CW CO
15	CT N2	60	CW CO2
16	GT DF N	61	CW NOX
17	GT CF N	62	DE H L O
18	DE HC IR	63	DE OLEF
19	DE HC FI	64	DE AROM
20	DE CO	65	DE H L O
21	DE CO2	65	DE H LOA
22	DE NOX	66	UE OLEF
23	DE O2	67	UE AROM
24	DELTA P2	68	UE PAR
25	CPM 2	69	CE OLEF
26	CT SAMP	70	CE AROM
27	GT DF S	71	CE PAR
28	GT CF S	72	EW OLEF
29	UE HC IR	73	EW AROM
30	UE HC FI	74	EW PAR
31	UE CO	75	CW OLEF
32	UE CO2	76	CW AROM
33	UE NOX	77	CW PAR
34	UE O2	78	A/F CO2
35	DELTA P3	79	A/F CO
36	CPM 3	80	A/F AVE.
37	CT CARB	81	C PCTAIR
38	GT DF C	82	N PCTAIR
39	GT CF C	83	N MI/GAL
40	EW HC IR	84	C MI/GAL
41	EW HC FI	85	C DILRAT
42	EW CO	86	EFF DIL
43	EW CO2	87	A/F DIFF RICH
44	EW NOX	88	A/F DIFF LEAN
45	RATIO		

TABLE 3

```
VARIABLES STORED FOR LINEAR LEAST SQUARES STUDIES
               1   HOUSTON
               2   PHOENIX
               3   CHEVROLET
               4   FORD
               5   HOUS X CHEV
               6   HOUS X FORD
               7   PHOE X CHEV
               8   PHOE X FORD
               9   ODOM. MILES
              10   A/F RATIO
              11   AMBIENT TEMP
              12   PCT HUM O
              13   CARB. TEMP.
              14   CE HC FID
              15   CW HC FID
              16   CE CO
              17   CW CO
              18   CE NOX
              19   CW NOX
              20   AMBIENT PR.
              21   A/F DIF RICH
              22   A/F DIF LEAN
              23   CE HC IR
              24   CW HC IR
              25   CE CO2
              26   CW CO2
              27   UE O2
              28   SCF EX
              29   C MPG
              30   LOG MILES
              31   LOG CE HC FI
              32   LOG CW HC FI
              33   LOG CE HC IR
              34   LOG CW HC IR
              35   LOG CE NOX
              36   LOG CW NOX
              37   LOG CE CO
              38   LOG CW CO
              39   LOG CE CO2
              40   LOG CW CO2
              41     1.0
```

2. Mathematical Model and Example of Data Treatment (Basis of Analysis)

The mathematical model used in this contract to represent the emission data is a linear one:

$$Y = \mu + \Sigma\alpha_i + \Sigma\beta_j + \Sigma\gamma_{ij} + \delta X + \epsilon$$

where Y is an observed variable (such as lb HC FID/mile) and X is a possible correlating variable, here the odometer miles or, sometimes, log miles. The Greek symbols represent overall levels, with δ the overall slope or "regression" coefficient giving the change in the variable per unit of mileage. The overall average level is μ; the city effects are represented by the α. For convenience, these are summed to zero so that only two need be specified.

α_1 for Houston

α_2 for Phoenix

The third is obtained by difference

$\alpha_3 = -\alpha_1 - \alpha_2$ for Cincinnati

Similarly the β represents the car-make effects

β_1 for Chevrolet

β_2 for Ford

and the third by difference

$\beta_3 = -\beta_1 - \beta_2$ for Plymouth

The γ represents the corresponding car make-city interaction terms; only four need be specified corresponding to the four independent degrees of freedom.

γ_{11} for Houston x Chevrolet

γ_{12} for Houston x Ford

γ_{21} for Phoenix x Chevrolet

γ_{22} for Phoenix x Ford

The other five of the nine possibilities are obtained from the row and column zero-sums.

$\gamma_{13} = -\gamma_{11} - \gamma_{12}$ for Houston x Plymouth

$\gamma_{23} = -\gamma_{21} - \gamma_{22}$ for Phoenix x Plymouth

$\gamma_{31} = -\gamma_{11} - \gamma_{21}$ for Cincinnati x Chevrolet

$\gamma_{32} = -\gamma_{12} - \gamma_{22}$ for Cincinnati x Ford

$\gamma_{33} = -\gamma_{13} - \gamma_{23}$ for Cincinnati x Plymouth

Also

$\gamma_{33} = \gamma_{11} + \gamma_{12} + \gamma_{21} + \gamma_{22}$

The error term ε is the difference between the observed Y values and those predicted by the model. The method used here to solve for the constants needs no assumption regarding the form of the distribution of these error terms; the constants are determined by the method of least squares so that the sum of squares of the residuals is a minimum.

The slope δ is not subscripted. It applies to all cars and to all cities as specified in the contract. Subsets of the data can also be handled separately, but the prime purpose is to determine whether the inclusion of a term for mileage provides a meaningful improvement in representation of the data by the model. The strict application of classical statistical tests based on Normal distribution theory is only correct when the data are known to be Normally distributed. There is no reason to believe that these tests are robust enough to justify their blind use for these data.

The slope δ is not the slope that would be obtained if the best line were drawn through the points on an X - Y plot. Instead, in accordance with the model including all interaction terms, it is the slope used to represent the nine separate sets of city-car make data; each set has the same slope but the intercept depends on μ, α_i, β_j and γ_{ij}. The common slope and the intercept coefficients are determined so that the total sum of squared residuals for all the sets together is a minimum.

The model is exactly equivalent to a conventional variance analysis (without the δX term) for a 3 x 3 crossed factorial experiment or to a covariance analysis with the δX term. The mean square variances for the main effects and the interactions can be obtained by conventional methods using the values of the α, β, and γ obtained from the least squares treatment or by the examination of the standard errors of fit as noted below. A moderate amount of inequality in the subclass numbers has essentially no effect, since the model is completely general.

The two computer programs described above were used to solve the relations. Program SELECT not only stored the needed data on the DEL0 file but also generated the set of "dummy variables" for each data point. These corresponded to the two independent α values, the two independent β values, and the four independent γ values. For example, a data point for a Plymouth in Cincinnati (that is i = 3, j = 3) would have dummy variables as shown below:

Variable	1	α_1	-1.0
	2	α_2	-1.0
	3	β_1	-1.0
	4	β_2	-1.0
	5	γ_{11}	+1.0
	6	γ_{12}	+1.0
	7	γ_{21}	+1.0
	8	γ_{22}	+1.0

A simpler example for a Chevrolet in Houston (that is $i = 1$, $j = 1$) would be

Variable	1	α_1	1.0
	2	α_2	0.0
	3	β_1	1.0
	4	β_2	0.0
	5	γ_{11}	1.0
	6	γ_{21}	0.0
	7	γ_{12}	0.0
	8	γ_{22}	0.0

The order in which the variables are put into the least squares model shows directly the reduction in the sum of squares because of the city effect or the car make effect or the city and car make effects together without the interactions, etc. ad lib. This is the basic technique used to analyze these data. It is certainly the most powerful technique available and can be readily extended to transformations of either the X or Y values or both. In addition, it is the only method available for these covariance studies, since the number of data points in each of the nine city-make subclasses is not necessarily the same for all subclasses.

The implementation was carried out by the following scheme. The set of data was fitted to the equation without the covariate

$$Y = \mu_0 + \alpha_i + \beta_j + \gamma_{ij} + \epsilon$$

(that is, to the nine city-car make means) with a resulting standard error of fit (SE). The covariate (miles or log miles) was then added

$$Y = \mu_0 + \alpha_i + \beta_j + \gamma_{ij} + bX + \epsilon$$

resulting in new values of the parameters and a new SE. Direct comparison of the two SE values shows how effective the covariate was in reducing the SE. Inspection of the t-value associated with the coefficient for the covariate shows whether the reduction in SE is "statistically significant."

The analysis of covariance sums of squares and mean squares for the main effects and interaction can be obtained from the α, β and γ coefficients in the equation just above. (This technique is described and illustrated below.) The same results can be obtained by fitting the model

$$\mu_0 + \alpha_i + \beta_j + \gamma_{ij} + \epsilon$$

to the "adjusted" values

$$Y = \delta (x - \bar{x})$$

where, for convenience $\bar{x}$ is the mean of all the x values, that is, the average miles or log miles. Comparison of the standard errors gives the sums of squares for cities, then makes, then interactions.

Example -- The set of 716 data points for all device-equipped cars in the three cities will be used as an example. The dependent variable is chosen to be lb/mile HC-FID scaled by multiplying by 10000. Miles are also scaled by dividing by 10000. The overall mean and standard deviations are:

mean	86.0577
SD	31.9850

The goodness of fit when cities, makes, and interaction are considered is

SE	28.3720
DF	707
R	0.471
$1-R^2$	0.778

where DF is degrees of freedom and R is the correlation coefficient. Inclusion of miles gives a small reduction in the standard error of fit.

SE	26.2360
DF	706
R	0.580
$1-R^2$	0.664

(or in other words, using the last value shown, the inclusion of miles has accounted for or "explained" 11% of the variation, but 66% is still not explained). The coefficient for the mileage effect is 7.3084, that is

0.00073084 lb/mile per 10000 miles.

The t-value for this value is 11.01, a very high value indicating that, even though the reduction in the SE of fit is small (from 28.4 down to only 26.2), the effect of including miles in the model is a statistically "significant" one. With a smaller number of data points, the effect could be completely masked, since the absolute magnitude is small compared with the scatter of the values. (The F value for the effect of miles in the covariance analysis below 121.2 is the square of this t-value.)

In the next step of the analysis, the data are now "adjusted"

$$Y - 7.3084\ (X - 1.64319515)$$

where X is miles divided by 10000 and 7.3084 is the regression coefficient. These adjusted values are then fitted to

$$\mu_0 + \alpha_i + \beta_j + \gamma_{ij} + \epsilon$$

in steps. (Note that the number of degrees of freedom is one too large, so that the SE shown are a little too small. This is allowed for in the calculation of the sums of squares.) The process is shown below.

Successive Fitting of "Adjusted" Data

Scaled by 10000

Computer DF	Computer SE	Actual Sum of Squares	Differences in Sum of Squares
(overall mean)			
715	29.8872	638670	
(plus cities)			57746
713	28.5440	580924	(cities)
(plus makes)			82363
711	26.4824	498561	(makes)
(plus interaction)			12722
707	26.2142	485839	(interaction)

As a check on the internal computer arithmetic (which uses 7.2 significant figures) two more calculations were made for this effluent only:

Computer DF	Computer SE	Actual Sum of Squares	Differences in Sum of Squares
(overall mean plus makes)			82704
713	27.9241	555966	(makes)
(overall mean plus interaction)			12825
711	29.6687	625845	(interaction)

The value of the SE for the equation

$$Y - b(X - \bar{X}) = \mu_0 + \alpha_i + \beta_j + \gamma_{ij}$$

is also a measure of the overall goodness of fit. The value obtained earlier is

706	26.2300	485737 (error)

a very good check on the sum of squares (485839).

The standard covariance table is obtained by collecting the values.

Source	Degrees of Freedom	Sum of Squares	Mean Square	F
Cities	2	57746	28873	42.0
Makes	2	82363	41181	59.9
Cities x Makes	4	12722	3181	4.6
Miles	1	83377	83377	121.2
Error	706	485737	688	1.0

Critical F-values for various one-sided probability levels are given below for 706 error degrees of freedom.

	Degrees of Freedom		
	1	2	4
10%	2.72	2.31	1.95
5%	3.85	3.01	2.38
1%	6.67	4.64	3.35
0.1%	10.92	6.98	4.68

All effects are seen to be "significantly different" from zero even at the 0.1% level.

The same values for the covariance terms can be obtained from the coefficients of the equation of the original model for the unadjusted values:

$$Y = \mu_0 + \alpha_i + \beta_j + \gamma_{ij} + \delta X + \epsilon$$

The mean squares are

City effect $\frac{m}{p(p-1)} \Sigma\alpha_i^2$

Car make effect $\frac{m}{q(q-1)} \Sigma\beta_j^2$

Interaction effect $\frac{m}{pq(p-1)(q-1)} \Sigma\gamma_{ij}^2$

Error term Std. error of fit squared

Here m is the total number of data points (71[illegible]), p the number of cities (3), and q the number of car makes (3). The three coefficients are 119.333, 119.333 and 19.889. Note the summations must extend over the three α_i, the three β_j, and the nine γ_{ij}.

The individual terms for the same example and the covariance values are shown in the accompanying table. The agreement with the results from the successive residual sums of squares of the "adjusted" values is very good.

Covariance Sums of Squares directly from Least Squares Coefficients

HC FID lb/mile times 10000

Symbol	Term	Value
μ_0	Intercept	73.9887
α_1	Houston	+ 12.6608
α_2	Phoenix	- 6.9107
α_3	Cincinnati	- 5.7501
β_1	Chevrolet	- 14.7564
β_2	Ford	+ 4.2479
β_3	Plymouth	+ 10.5085
γ_{11}	Houston x Chevrolet	+ 1.4452
γ_{12}	Houston x Ford	+ 3.7182
γ_{13}	Houston x Plymouth	- 5.1634
γ_{21}	Phoenix x Chevrolet	+ 0.9204
γ_{22}	Phoenix x Ford	+ 1.9864
γ_{23}	Phoenix x Plymouth	- 2.9068
γ_{31}	Cincinnati x Chevrolet	- 2.3656
γ_{32}	Cincinnati x Ford	- 5.7046
γ_{33}	Cincinnati x Plymouth	+ 8.0702

Source	D. F.	Sum of Squares	Mean Square	F
Cities	2	57547	28773	41.8
Makes	2	82632	41316	60.1
Cities x Makes	4	12656	3164	4.6
Error	706	485737	688	1.0

Note on Covariance Analysis

The literature on covariance is extensive. For example, seven major papers with very extensive bibliographies are included in the September 1957 issue of Biometrics devoted to the subject. The use of dummy variables is noted occasionally. However, most of the methodology was developed long before high-speed computation was available, so that some of the more direct methods for fixed-effect models were unfeasible. The methodology used in this work combines least squares linear analysis ("regression") techniques, the use of "dummy" variables to handle possibly unequal numbers of values in the subclasses, and the calculation of covariance effects and interactions from variance analyses on the adjusted values. Useful references included Bennett and Franklin's *Statistical Analysis in Chemistry and the Chemical Industry* , especially the relation between variance analysis mean squares and the regression coefficients for the dummy variables in a crossed fixed-effect problem (Section 7.53) and Cochran and Cox's standard work *Experimental Designs* for the discussion on the use of "adjusted treatment means" for obtaining the covariance sums of squares. The special modifications to Ethyl Corporation's proprietary versatile linear least square fitting program for creating and handling adjusted values were available for these calculations and had been tested on a small synthetic covariance problem prior to its use during the contract.

VII. RESULTS OF DATA ANALYSIS

1. Covariance Analysis

A standard covariance analysis for unbalanced data was carried out using the "dummy variable" technique. The results for the three city-three make data are shown in Tables 4 and 5 for the emission data with and without a log transform. (The absolute magnitudes of the numbers shown may be in error by a few per cent because of the limitations of the internal IBM 360 computer arithmetic.) For ease in interpretation, Normal distribution F-values for several one-sided probability levels and 706 error degrees of freedom are given below.

	Degrees of Freedom		
	1	2	4
10%	2.72	2.31	1.95
5%	3.85	3.01	2.38
1%	6.67	4.64	3.35
0.1%	10.92	6.98	4.68

All but a few of the values correspond to probability levels below 5%; those above the 5% level are marked with a dagger in the tables. This analysis shows that generally the city effect on vehicle miles versus emissions is significant. In most instances, especially with a log transform, the interaction term is insignificant and small compared with the main effects. For the hydrocarbon and nitrogen oxides the effect of car make is large.

2. Least Squares Coefficients

Appendix 7 gives selected parts of the least squares results for the three cities-three makes data. The mathematical model and the general methodology are discussed in the following section. The two independent "dummy" variables for cities were taken to correspond to Houston and Phoenix, with Cincinnati obtained by difference. Similarly, Chevrolet and Ford were chosen for the car make variables and the corresponding four city-car make interaction terms as the remaining independent "dummy" variables. First, the coefficient tables give the successive results when only "dummy" variables are used, corresponding to the nine city-make means (Appendix 7, Table 2). Then miles are added as a covariate (Table 3) - note the change in the SE of fit. The twenty dependent variables are "adjusted" using the appropriate regression

TABLE 4

Covariance Analysis for Full Data Set with Miles as Covariate. Without log transform of effluent data.

		DF	SS	MS	F
CE HC FID	CITIES	2	15059175.	7529588.	7.7447
	MAKES	2	139073466.	69536733.	71.5237
	CITIES X MAKES	4	8212296.	2053074.	2.1117 †
	MILES	1	46657822.	46657822.	47.9910
	ERROR	706	686387371.	972220.	
CW HC FID	CITIES	2	57746.	28873.	41.9659
	MAKES	2	82362.	41181.	59.8553
	CITIES X MAKES	4	12722.	3181.	4.6228
	MILES	1	83377.	83377.	121.1859
	ERROR	706	485737.	688.	
CE CO	CITIES	2	2.2503	1.1252	2.6281
	MAKES	2	28.3119	14.1559	33.0659
	CITIES X MAKES	4	7.0705	1.7676	4.1288
	MILES	1	81.5660	81.5660	190.5166
	ERROR	706	302.2329	0.4281	
CW CO	CITIES	2	6486548.	3243274.	25.5942
	MAKES	2	7080845.	3540421.	27.9392
	CITIES X MAKES	4	90816736.	22704184.	179.1696
	MILES	1	33980873.	33980873.	268.1593
	ERROR	706	89461605.	126719.	
CE NOX	CITIES	2	3091514.	1545757.	7.4963
	MAKES	2	67319562.	33659781.	163.2362
	CITIES X MAKES	4	18282288.	4570572.	22.1654
	MILES	1	111381.	111381.	0.5402 †
	ERROR	706	145579261.	206203.	
CW NOX	CITIES	2	219817.	109909.	73.4803
	MAKES	2	444660.	222330.	148.6507
	CITIES X MAKES	4	128527.	32132.	21.4820
	MILES	1	34135.	34135.	22.8210
	ERROR	706	1056005.	1496.	
CE HC IR	CITIES	2	19013458.	9506729.	20.1142
	MAKES	2	23625097.	11812548.	24.9928
	CITIES X MAKES	4	2275360.	568840.	1.2035 †
	MILES	1	2105840.	2105840.	4.4554
	ERROR	706	333691606.	472651.	
CW HC IR	CITIES	2	17125.	8562.	29.7999
	MAKES	2	15399.	7700.	26.7986
	CITIES X MAKES	4	4051.	1013.	3.5288
	MILES	1	8293.	8293.	28.8644
	ERROR	706	202648.	287.	
CE CO2	CITIES	2	2.5594	1.2797	11.9763
	MAKES	2	3.6224	1.8112	16.9503
	CITIES X MAKES	4	6.1830	1.5458	14.4660
	MILES	1	8.7327	8.7327	81.7258
	ERROR	706	75.4391	0.1069	
CW CO2	CITIES	2	6.1306	3.0652	220.6836
	MAKES	2	0.0631	0.0315	2.2701 †
	CITIES X MAKES	4	0.3901	0.0975	7.0200
	MILES	1	1.2982	1.2982	93.4591
	ERROR	706	9.8070	0.0139	

---

† Normal distribution theory one-tailed probability more than 5%.

TABLE 5

Covariance Analysis for Full Data Set with Miles as Covariate, without log transform of effluent data.

LOG CE HC FI	CITIES	2	0.1350	0.0675	9.1765
	MAKES	2	1.9789	0.9894	135.5069
	CITIES X MAKES	4	0.0280	0.0070	0.9575 †
	MILES	1	0.5503	0.5503	75.3662
	ERROR	706	5.1550	0.0073	
LOG CW HC FI	CITIES	2	1.3890	0.6945	71.0620
	MAKES	2	2.0523	1.0262	105.5656
	CITIES X MAKES	4	0.1850	0.0462	4.7357
	MILES	1	1.6357	1.6357	167.4898
	ERROR	706	6.8967	0.0098	
LOG CE HC IR	CITIES	2	0.6954	0.3477	32.5231
	MAKES	2	1.0696	0.5348	50.0255
	CITIES X MAKES	4	0.0282	0.0071	0.6602 †
	MILES	1	0.0780	0.0780	7.2932
	ERROR	706	7.5471	0.0107	
LOG CW HC IR	CITIES	2	1.4697	0.7348	60.0189
	MAKES	2	1.1355	0.5677	46.3696
	CITIES X MAKES	4	0.1405	0.0351	2.8689
	MILES	1	0.6661	0.6661	54.4051
	ERROR	706	8.6439	0.0122	
LOG CE NOX	CITIES	2	0.1446	0.0723	5.7494
	MAKES	2	3.6867	1.8434	146.6267
	CITIES X MAKES	4	1.0336	0.2584	20.5552
	MILES	1	0.0028	0.0028	0.2245 †
	ERROR	706	8.8757	0.0126	
LOG CW NOX	CITIES	2	1.5835	0.7917	56.5020
	MAKES	2	3.7794	1.8897	134.8956
	CITIES X MAKES	4	0.9008	0.2252	16.0709
	MILES	1	0.3491	0.3491	24.9150
	ERROR	706	9.8929	0.0140	
LOG CE CO	CITIES	2	0.4012	0.2006	7.4914
	MAKES	2	0.5158	0.2579	9.6296
	CITIES X MAKES	4	0.1920	0.0480	1.7919 †
	MILES	1	5.8715	5.8715	219.2662
	ERROR	706	18.9068	0.0268	
LOG CW CO	CITIES	2	2.4598	1.2299	40.2458
	MAKES	2	0.5301	0.2650	8.6728
	CITIES X MAKES	4	0.1496	0.0374	1.2235 †
	MILES	1	8.8111	8.8111	288.3249
	ERROR	706	21.5756	0.0306	
LOG CE CO2	CITIES	2	0.0029	0.0015	7.1169
	MAKES	2	0.0045	0.0022	10.7772
	CITIES X MAKES	4	0.0071	0.0018	8.5504
	MILES	1	0.0095	0.0095	45.7813
	ERROR	706	0.1458	0.0002	
LOG CW CO2	CITIES	2	1.1163	0.5582	209.3557
	MAKES	2	0.0060	0.0030	1.1294 †
	CITIES X MAKES	4	0.0683	0.0171	6.4023
	MILES	1	0.2011	0.2011	75.4217
	ERROR	706	1.8823	0.0027	

† Normal distribution theory one-tailed probability more than 5%.

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coefficients, and the least squares fitting is carried out in steps. Tables in Appendix 7 show results (1) with only the overall means (Table 4), (2) with cities (Table 5), (3) with cities and makes (Table 6), and (4) with cities, car makes and interaction (Table 7). The covariance sums of squares were obtained from the standard errors shown, using the technique described in the section on the mathematical model below.

Table 8 presents the results using log miles as the covariate. Comparison with Table 7 shows the effect of adding log miles as the covariate. Inspection of Tables 3 (miles) and 8 (log miles) shows that the use of log miles gives a slightly better fit.

3. Effect of Mileage on Emissions

Table 6 in text summarizes the effect of miles on emission levels for all cities and all makes. The overall mean is shown as a basis of comparison. The t-values are statistical measures of probability. There is no guarantee that the data are Normally distributed, but as a rough rule of thumb, t-values based on Normal distribution theory over 2.0 are considered to be unlikely (one-in-forty chance on the high or low side) and t-values over 4.0 to be extremely unlikely (less than one-in-ten thousand chance) to have been caused by purely chance causes. Except for NO_x as ppm, all variables studied (with and without a logarithm transform) are strongly correlated with miles. The correlation with log miles is only slightly better than that with miles.

The regression coefficients are expressed as absolute values and as percentages, both per 10000 miles. For example, on average, the HC-FID increases by 175 ppmC per 10000 miles or by 4.9% of the average value (3576) per 10000 miles.

Although the effect of mileage is statistically significant, inclusion of miles or log miles on the data (with and without a log tansform) has surprisingly little effect on the standard error of fit of the linear model chosen to represent the data (Table 7). The SE without miles is a measure of the overall spread of the data from each of the nine city-car make averages. Inclusion of miles or log miles hardly changes the value. The new SE of fit is still a large percentage of the average, and the correlation coefficient R is quite low. The square of R is given in the table; R^2 is a measure of the fraction of variation accounted for by the model. At best it is 47%, but it sometimes drops as low as 13%, reflecting the large spread of the data.

TABLE 6

Effect of Miles on Emissions

All Cities and Makes

Variables[a]	Average	Coefficient[b] Value	Coefficient[b] Per Cent	Miles t-Value	Log Miles t-Value
HC FID	3576 0.00861	173.9 0.000731	4.8 8.5	6.93 11.01	9.81 11.87
HC IR	1899 0.00454	36.73 0.000231	1.9 5.1	2.11 5.38	6.06 8.02
CO	1.581 0 07809	0.2286 0.0148	14.5 19.0	13.80 16.38	13.74 14.73
CO_2	13.320 1.101	-0.0748 0.0288	-0.6 2.6	9.04 9.67	-- --
NO_x	1920 0.01526	8.451 0.000468	0.4 3.1	0.74 4.78	2.98 5.27
log HC FID	3.539 -2.087	0.0188 0.0324	4.4 7.8	8.68 12.94	12.62 14.98
log HC IR	3.260 -2.365	0.0071 0.0207	1.7 4.9	2.70 7.38	8.03 11.54
log CO	0.156 -1.163	0.0613 0.0751	15.2 18.9	14.81 16.98	16.31 17.03
log CO_2	1.124 0.001	-0.0025 0.0113	-0.6 2.6	5.77 8.68	-- --
log NO_x	3.262 -1.842	0.0013 0.0150	0.3 3.5	0.47 4.39	3.49 8.81

[a] The first value is in concentration units, the second in lb/mile.

[b] The odometer miles are scaled by 10000.

TABLE 7

Effect of Miles on Standard Error of Fit of Linear Model, All Cities and Makes

Variable[a]	Average	Without miles	With miles			With log miles		
		SE	SE	Per Cent	R^2	SE	Per Cent	R^2
HC FID	3576	1018.3	986.0	27.6	0.24	955.9	26.7	0.29
	0.00861	0.00284	0.00262	30.4	0.34	0.00259	30.1	0.35
HC IR	1899	689.2	687.5	36.2	0.13	672.4	35.4	0.16
	0.00454	0.00173	0.00170	37.4	0.19	0.00166	36.6	0.22
CO	1.581	0.737	0.654	41.4	0.29	0.655	41.4	0.29
	0.07809	0.0418	0.0356	45.6	0.36	0.0366	46.9	0.33
CO_2	13.329	0.345	0.327	2.5	0.23	—	—	—
	1.101	0.125	0.118	10.7	0.45	—	—	—
NO_x	1920	453.9	454.1	23.7	0.38	451.4	23.5	0.39
	0.01526	0.00393	0.00387	25.4	0.44	0.00385	25.2	0.46
log HC FID	3.538	0.090	0.085	21.6	0.35	0.081	20.5	0.41
	-2.087	0.110	0.099	25.6	0.44	0.096	24.7	0.47
log HC IR	3.260	0.104	0.103	26.8	0.20	0.099	25.6	0.26
	-2.365	0.115	0.111	29.1	0.29	0.105	27.4	0.36
log CO	0.156	0.187	0.164	45.9	0.27	0.160	44.5	0.30
	-1.163	0.207	0.175	49.6	0.36	0.175	49.6	0.36
log CO_2	1.124	0.015	0.014	3.3	0.15	—	—	—
	0.001	0.054	0.052	11.3	0.42	—	—	—
log NO_x	3.262	0.112	0.112	29.4	0.35	0.112	29.4	0.36
	-1.842	0.120	0.118	31.2	0.40	0.118	31.2	0.41

a. The first value is in concentration units, the second in lb/mile.

b. R^2 is a measure of the amount of variation accounted for by the model.

4. Effect on Mileage for Individual Car Makes

A separate but smaller study was made of the data on HC-FID, HC-IR, CO and NO_x, with and without log transforms, for the individual car makes. The results are summarized in Tables 11, 12, and 13. An overview of the essential differences between the makes can be obtained from three capsule summaries without log transforms. In all tables the first value is in concentration limits, the second in pounds per mile.

TABLE 8

Average Effluent Level

	Chev.	Ford	Plym.	All
HC-FID	2959 0.0071	3741 0.009[illegible]	4018 0.0097	3[illegible] 0.0086
HC-IR	1652 0.0039	2088 0.0050	1953 0.0047	1899 0.0045
CO	1.41 0.0070	1.45 0.071	1.87 0.093	1.58 0.078
NO_x	1496 0.012	2034 0.016	2223 0.018	1920 0.015

Clearly the Chevrolet with the A.I.R. device has the lowest effluent levels. However the individual variability is inherently very high. A good measure is the standard error of fit to the linear model including miles (Table 9) all reduced to a percentage basis for ease of comparison.

TABLE 9

Standard Error of Fit, Percentage of Overall Average

	Chev.	Ford	Plym.	All
HC-FID	18 25	31 34	26 27	28 30
HC-IR	22 21	41 44	36 35	36 37
CO	39 40	25 30	50 51	41 46
NO_x	24 25	18 20	26 28	24 25

The Fords have the poorest reproducibility for the hydrocarbon effluents, the Chevrolets have the best. On the other hand, the nitrogen oxide data is notably more reproducible in the Fords.

The effect of miles can be put on a common basis by expressing it as a percentage of the overall average per 10,000 miles of vehicle operation. Values in parentheses are not significantly different from zero at the 5% level.

TABLE 10

Effect of Miles
Percentage of average per 10,000 miles

	Chev.	Ford	Plym.	All
FID	1.7	(1.9)	9.4	4.8
	8.0	(2.7)	13.7	8.5
IR	-2.1	(-1.0)	7.8	1.9
	3.1	(-0.4)	11.9	5.1
CO	11.7	7.7	20.9	14.5
	18.5	8.9	25.8	19.0
NO_x	2.1	3.2	-2.9	0.4
	6.8	3.5	(0.4)	3.1

The first value is in concentration units, the second in lb/mile. It is obvious that the Plymouths exhibit large changes in hydrocarbon and CO emission levels as the vehicle mileage increases. The relative magnitude compared with the Chevrolets and Fords is highly significant from a statistical viewpoint; note the very high t-values in Tables 11 and 12. On the other hand the nitrogen oxide results are somewhat contradictory with negative to no effect for the Plymouths and only a small effect for the other two makes.

The general conclusions are essentially the same when the effluents are considered using a log transform.

TABLE 11

Effect of Miles on Emissions. Chevrolets.

Variable	Average	Without miles SE	With miles			Coefficient		
			SE	Per Cent	R^2	Value	Per Cent	t-Value
HC FID	1959 0.00708	549 0.00196	546 0.00178	18.4 25.1	0.06 0.34	49.3 0.000567	1.7 8.0	2.02 7.13
HC IR	1652 0.00390	372 0.00083	370 0.00081	22.4 20.8	0.11 0.25	-34.13 0.000121	-2.1 3.1	2.06 3.35
CO	1.412 0.0701	0.482 0.0337	0.418 0.0279	29.6 39.8	0.29 0.40	0.165 0.0130	11.7 18.5	8.62 10.42
NO_x	1496 0.01175	361 0.00316	359 0.00294	24.0 25.0	0.06 0.16	31.40 0.000803	2.1 6.8	1.96 6.10
log HC FID	1.464 -2.153	0.076 0.089	0.076 0.079	19.1 19.9	0.04 0.40	0.0052 0.0273	1.2 6.5	1.53 7.72
log HC IR	3.207 -2.420	0.095 0.086	0.094 0.085	24.2 21.6	0.09 0.26	-0.0098 0.0123	-2.3 2.9	2.34 3.22
log CO	0.125 -1.197	0.142 0.172	0.124 0.139	33.0 37.7	0.28 0.45	0.0472 0.0694	11.5 17.3	8.49 11.19
log NO_x	3.161 -1.946	0.112 0.118	0.112 0.110	29.4 28.8	0.07 0.16	0.0086 0.0307	2.0 7.3	2.73 6.27

a. The first value is in concentration units, the second in lb/mile.

b. R^2 is a measure of the amount of variation accounted for by the model.

TABLE 12

Effect of Miles on Emissions. Fords.

Variable	Average	Without miles SE	With miles SE	With miles Per Cent	With miles R^2	Coefficient Value	Coefficient Per Cent	Coefficient t-Value
HC FID	3741 0.00901	1170 0.00304	1169 0.00303	31.2 33.6	0.02 0.16	71.4 0.000239	1.9 2.7	1.37 1.78
HC IR	2069 0.00501	862 0.00218	864 0.00218	42.4 43.5	0.04 0.09	-20.24 -0.000021	-1.0 -0.4	0.53 0.21
CO	1.453 0.0710	0.401 0.0229	0.366 0.0210	25.2 29.6	0.17 0.28	0.112 0.00635	7.7 8.9	6.91 5.82
NO_x	2034 0.0163	384 0.00333	373 0.00323	18.3 19.8	0.19 0.47	65.2 0.000570	3.2 3.5	3.94 3.98
log HC FID	3.567 -2.064	0.096 0.104	0.095 0.103	24.5 26.8	0.05 0.26	0.0106 0.0122	2.4 2.9	2.47 2.68
log HC IR	3.300 -2.324	0.114 0.121	0.114 0.121	30.8 32.1	0.59 0.16	-0.00229 -0.00069	-0.5 -0.1	-0.45 -0.07
log CO	0.147 -1.172	0.117 0.130	0.106 0.120	27.6 31.8	0.18 0.28	0.0340 0.0360	8.1 8.6	7.20 6.78
log NO_x	3.299 -1.805	0.086 0.092	0.084 0.089	21.3 22.7	0.17 0.46	0.0136 0.0154	3.2 3.6	3.64 3.90

a. The first value is in concentration units, the second in lb/mile.

b. R^2 is a measure of the amount of variation accounted for by the model.

TABLE 12

Effect of Miles on Emissions. Plymouth.

Variable	Average	Without miles SE	With miles SE	With miles Per Cent	With miles R^2	Coefficient[a] Value	Coefficient[a] Per Cent	Coefficient[a] t-Value
HC FID	4018	1193	1047	26.1	0.27	376.9	9.4	8.47
	0.00970	0.00332	0.00263	27.1	0.41	0.00133	13.7	11.98
HC IR	1953	732	695	35.6	0.18	152.8	7.8	5.17
	0.00476	0.00186	0.00166	35.3	0.27	0.000559	11.9	7.92
CO	1.875	1.109	0.935	49.9	0.31	0.392	20.9	9.87
	0.0931	0.0597	0.0472	50.7	0.41	0.0240	25.8	11.99
NO_x	2223	581	574	25.8	0.17	-64.3	-2.9	2.64
	0.0177	0.00501	0.00502	28.4	0.19	0.000071	0.4	0.33
log HC FID	3.589	0.108	0.091	23.3	0.32	0.0384	9.3	9.96
	-2.035	0.130	0.099	25.6	0.46	0.0556	13.7	13.20
log HC IR	3.272	0.111	0.101	26.2	0.26	0.0307	7.3	7.13
	-2.352	0.130	0.107	27.9	0.39	0.0470	11.6	10.46
log CO	0.197	0.266	0.220	66.0	0.33	0.0991	25.6	10.62
	-1.122	0.286	0.225	67.9	0.40	0.1163	30.7	12.17
log NO_x	3.325	0.141	0.139	37.7	0.18	-0.0167	-3.9	2.82
	-1.778	0.143	0.144	39.3	0.26	0.0004	0.1	0.07

a. The first value is in concentration units, the second in lb/mile.

b. R^2 is a measure of the amount of variation accounted for by the model.

5. Effect of Mileage in Control Cars

The tests on Ethyl Corporation's two Chevrolets and two Plymouths in Rounds 1 to 4 in Houston and Phoenix and Round 4 in Cincinnati provide a comparison for the same car makes among the GSA vehicles. The data were analysed in exactly the same way as was the larger set for individual car makes (Table 14). The average mileage of the Ethyl cars was considerably greater than that of the other cars, reaching almost 70,000 miles, since they were driven from city to city. While the Ethyl cars were well maintained throughout the test period, they showed emission levels of the same magnitude as the full set of data.

In general, the variability of the data as measured by the standard error of fit (SE) is a little lower for the Ethyl cars. However, the effect of mileage is insignificant, in direct contract to the conclusions for the full data set. In no case does the t-value reach the 2.0 level and, in many cases, the signs of the mileage coefficient are different for the data on a concentration and weight basis.

The general magnitude of the mileage effect found in the analysis of the full set of data was quite small, but it was established to be statistically significant because of the large number of data points involved (over 700 degrees of freedom).

6. Omission of Round 2 in Houston

The ambient air temperatures in Houston were about 25°F higher than normal during Round 2. The full set of calculations with three cities and three car makes was repeated, omitting this round in Houstin, in order to evaluate whether the higher temperatures had any effect on the influence of mileage. (The log miles transform alternative was not included.)

The results (Tables 15 and 16) are so close to those of the complete set (Tables 6 and 7) that detailed comparisons are pointless.

TABLE [illegible]

[illegible]

	Average	Without Miles SE	With Miles SE	With Miles Per Cent	With Miles R^2	Coefficient Value	Coefficient Per Cent	t Value
HC FID	3506 0.00082	516 0.00149	519 0.00149	15 17	0.47 0.45	-22.37 0.000025	-0.3 1.3	0.36 1.16
HC IR	1731 0.00425	285 0.00076	277 0.00077	16 17	0.36 0.32	-73.22 0.000021	-1.3 0.2	1.27 0.21
CO	1.670 0.0056	0.552 0.0301	0.565 0.0308	34 35	0.03 0.07	0.0163 0.00105	1.0 2.3	0.44 0.96
NO_x	1982 0.0166	452 0.00330	452 0.00383	23 23	0.54 0.50	-51.98 -0.000126	-2.6 -0.7	1.73 0.46
log HC FID	3.536 -2.065	0.071 0.075	0.071 0.075	18 19	0.45 0.43	-0.0024 0.0046	-0.6 1.1	0.50 0.96
log HC IR	3.229 -2.371	0.077 0.080	0.076 0.080	19 20	0.36 0.32	-0.0085 0.0005	-1.5 0.1	1.28 0.10
log CO	4.197 -1.098	0.155 0.167	0.158 0.166	44 47	0.05 0.11	0.0086 0.0169	2.3 4.0	0.66 1.51
log NO_x	3.276 -1.785	0.109 0.105	0.107 0.105	28 27	0.47 0.40	-0.0123 -0.0053	-2.9 -1.2	1.74 0.75

a. The first value is in concentration units, the second in lb/mile.

b. R^2 is a measure of the amount of variation accounted for by the model.

TABLE 15

Effects of Miles on Emissions Excluding Round 2, Houston[a]

Variable	Average	Coefficient Value	Coefficient Per Cent	Miles t-Value
HC FID	3546	171.7	5.4	7.33
	0.00849	0.000766	9.0	11.00
HC IR	1883	45.48	3.4	2.48
	0.00447	0.000246	5.5	5.43
CO	1.563	0.2441	5.6	14.59
	0.07680	0.0154	20.1	17.04
CO_2	13.319	-0.0773	-0.6	9.19
	1.009	0.0273	2.7	8.98
NO_x	1942	-3.583	-0.2	0.31
	0.01535	0.000345	2.2	3.55
log HC FID	3.534	0.0214	5.1	9.59
	-2.094	0.0345	8.3	13.33
log HC IR	3.255	0.0094	2.2	3.44
	-2.373	0.0226	5.3	7.71
log CO	0.150	0.0665	16.6	16.00
	-1.172	0.0799	20.2	17.87
log CO_2	1.124	-0.0025	-0.6	6.96
	-0.002	0.0108	2.5	8.05
log NO_x	-2.373	-0.0015	-0.4	-0.53
	3.268	0.0117	2.7	3.96

[a] 652 data points. See footnotes to Table 6.

TABLE 16

Effect of Miles on Standard Error of Fit of Linear Model Excluding Round 2, Houston[a]

Variable	Average	Without Miles SE	With Miles SE	With Miles Per Cent	With Miles R^2
HC FID	3546	1053	1013	28.5	0.25
	0.00849	0.00294	0.00270	31.8	0.33
HC IR	1683	714	711	37.8	0.13
	0.00447	0.00179	0.00176	39.3	0.18
CO	1.563	0.746	0.648	41.5	0.33
	0.07680	0.0422	0.0351	45.7	0.40
CO_2	13.319	0.346	0.326	2.5	0.25
	1.009	0.125	0.118	11.7	0.47
NO_x	1942	447	448	23.1	0.39
	0.01535	0.00380	0.00377	24.6	0.47
log HC FID	3.534	0.092	0.086	21.9	0.37
	-2.094	0.113	0.100	25.9	0.44
log HC IR	3.255	0.107	0.106	27.6	0.21
	-2.373	0.118	0.113	29.7	0.27
log CO	0.150	0.190	0.161	44.9	0.31
	-1.172	0.211	0.173	48.9	0.39
log CO_2	1.124	0.015	0.014	3.3	0.17
	-0.002	0.055	0.052	12.5	0.44
log NO_x	3.268	0.109	0.109	28.5	0.36
	-1.839	0.116	0.114	30.0	0.43

a. 692 data points. See footnotes to Table 6.

Motor Vehicle Emission Lab
LIBRARY

VIII. APPENDICES

APPENDIX 1. START-UP OPERATIONS IN EACH CITY

General

1. Drive mobile laboratory to selected test site.
2. Place jacks under trailer at four corners of body.
3. Connect power cable to 220 A.C. - 3 wire-single phase power supply.
4. Fill water tank or make connection to water supply tap.
5. Install in laboratory one cylinder of 60% nitrogen - 40% hydrogen, one cylinder of air, one cylinder of nitrogen, and one cylinder of span gas (these gases will be shipped from Scott Laboratories to the test cities before arrival of the laboratory).
6. Arrange for line connection of telephone in laboratory.
7. Free instruments from hold-down mounts.
8. Prepare laboratory for initial calibration operations.

Analytical Instruments

1. Turn on regulated and unregulated power.
2. Check meter zero on all instruments and adjust zero screw on meter face, if necessary.
3. Turn on voltage regulator.
4. Install batteries in FID instrument and remove tape from Vibrode.
5. Turn on power switches on all NDIR analysers and on FID (oxygen analyser power comes on with voltage regulator).
6. Turn on choppers on all NDIR instruments.
7. Connect gas cylinders (air, nitrogen, span gas, and FID fuel mixture) to appropriate tubing. Note: Cylinders should be in trailer overnight so they are at equilibrium with trailer temperature, which is regulated to 70°F.
8. Turn on air and FID fuel to FID instrument.
9. Adjust fuel to correct pressure (indicated inside of instrument) using instrument fuel control. The cylinder regulator should be set about 5 psi higher than the pressure required at the instrument.

B. Analytical Instruments (continued)

10. Turn FID attenuator to X1000.
11. Adjust air to about 10-12 psi using instrument air control.
12. Wait one minute to allow purging of lines.
13. Turn Power switch to Ignite position (ignition of flame causes an audible popping sound). If flame does not ignite within 5 or 6 seconds, release switch from Ignite position, wait another minute for additional purging, and then try ignition again.
14. Turn FID Attenuator to X300 and introduce span gas. An upscale reading indicates flame has stayed lit. (It is possible to hear the popping sound without the flame staying lit.)
15. After it has been determined that the flame is lit, increase air pressure to the value indicated inside of the instrument. The air cylinder regulator should be about 5 psi higher than the pressure required by the instrument. Note: Before proceeding further, allow one hour for the instrument to stabilize.
16. During the waiting period, clean and recharge the oxygen sensor as follows:

    a. Remove outer screw-on cap, O-ring, and used membrane. Retain O-ring and discard membrane. Use water to wash off old gel.

    b. With finger or moist tissue paper sprinkled with small amount of household scouring powder, thoroughly scour anode surface. In same manner, clean cathode and epoxy surfaces which have been in contact with gel. Rinse thoroughly in tap water. Use distilled water to rinse. Use plastic squeeze bottle with small nozzle, rather than submerging sensor body. Rinse off O-rings. Use soft cleansing tissue to wipe off cathode. CAUTION: After cleaning, do not touch anode-cathode surface with hands.

    c. Apply small quantity of electrolyte gel (supplied) over anode-cathode surfaces.

    d. Take approximately a square inch of Teflon film (supplied in charging kit) and carefully place it directly over electrolyte gel. This is accomplished by holding film at one corner and

B. Analytical Instruments (continued)

d. (continued)
pulling it over cathode. Replace previously removed O-ring in groove provided on silver body.
CAUTION: Never touch the center of the Teflon square with your fingers. Contaminated membranes must be replaced or else washed thoroughly with cleansing powder and rinsed thoroughly, with final rinse of distilled water before using. Contaminants cause sensor to have excessive residual current (meter will show a false 1-2% oxygen reading when sensor is exposed to 100% nitrogen gas). Do not overtighten the membrane. The membrane should never be stretched to the extent that it becomes white-opaque in color.

e. Trim the membrane and wipe off all excess gel.

f. Replace outer cap, making sure that O-ring on body is in position and that small O-ring in cap has not slipped out of place.

g. Save remaining gel, Teflon membranes, and spare O-rings in kit for future use. NOTE: Replace O-rings only when originals wear out.

17. Before checking out NDIR hydrocarbon analyzer, open instrument and recharge CO_2 filter cell. Complete check out with instrument open. When check-out is finished, close the instrument.

C. Saltzman NO_2

Fresh reagent solutions will be made at each city using preweighed chemicals, glacial acetic acid, and deionized distilled water.

1. Stock color reagent:
   N-(1-naphthyl)-ethylenediamine dihydrochloride, 0.1%.
   Dissolve 0.200 gram in 200 ml of distilled water.

C. Saltzman NO_2 (continued)

2. Absorbing reagent (4,000 ml batch):
    a. Place 2 liters of distilled water in two-gallon mixing container.
    b. Place liter of distilled water in a glass beaker, and heat to about 175°F. Add 20 grams of sulfanilic acid and stir to dissolve into solution.
    c. Add (b) to distilled water (a).
    d. Add 200 ml glacial acetic acid.
    e. Add 200 ml stock color reagent (Reagent 1.).
    f. Dilute to 4000 ml with distilled water.
    g. Mix well and store in refrigerator in dark-colored containers.
3. Standard sodium nitrite solution.

    Stock solution -- dissolve 0.2030 grams $NaNO_2$ in one liter distilled water. Working solution -- dilute 10 ml to 100 ml with distilled water. (Use 10-ml hypodermic needle and 100-ml volumetric flask.)

APPENDIX D. VEHICLE INSPECTIONS

General Outline

This procedure is followed after second exhaust sample has been checked, the proportional sampler removed from the vehicle, and original vehicle air cleaner replaced.

1. Drive vehicle on road to detect any abnormality in engine performance.
    - a. Idle
    - b. Acceleration
    - c. Steady-speed cruise
    - d. Deceleration
2. Park car in stall on left side of trailer facing same direction as trailer.
3. Install Test Equipment:
    - a. Timing light
    - b. Vacuum gage
    - c. Tach-dwell meter
    - d. Sun ignition analyzer
    - e. Sun exhaust gas analyzer
    - f. PCV flow meter in PCV line
4. Idle checks:
    - a. Read basic ignition timing with and without vacuum advance line connected (observe vacuum advance action).
    - b. Record idle RPM and cam dwell angle
    - c. Record PCV flow
    - d . Record air-fuel ratio (see part VI-B-1).
5. Component checks:
    - a. Apply brakes and observe performance of spark plugs with Sun ignition analyzer during full-throttle operation (test can be made for only a few seconds at a time to prevent over-heating of automatic transmission fluid).
    - b. Remove distributor. Check and record advance characteristics on Sun distributor tester. Reinstall distributor, and reset basic timing same as received.

General Outline (Continued)

c. Remove spark plugs. Put plugs in rack for reinstallation in same cylinder position.

d. Measure compression pressures at 150 rpm with throttle wide open. (Gasoline line need not be disconnected.) (See Part VI-B-2).

e. Reinstall spark plugs in same cylinder positions.

f. Check manifold heat valve for free operation, but do not free valve if stuck.

6. Again drive car for road performance.

7. Park car on line for return to fleet.

8. Record vehicle inspections made by GSA personnel and note type of driving (city, intercity, rural) during last 200-mile period.

Detailed Procedures

1. Idle air-fuel ratio -- This procedure is based on the extensive experience of Walter Pagley of Chrysler in using the Sun tester for setting idle mixture adjustment on cars with Chrysler's Cleaner Air Package. (CAP)

a. Precautions in handling and maintenance of equipment

1. Flexible exhaust probe line -- this line must not be kinked or bent in a radius smaller than the outside of the Exhaust Condenser. In withdrawing from the tailpipe, remove by pulling in a straight line. Do not use exhaust condenser as a handle to pull out probe.

2. Condenser unit -- watch glass bowl and dump when half full of water. Check for leaks in fittings and probe line by filling with water. Make certain that hose is on tight at condenser outlet fitting. As hose deteriorates and expands at the ends, it will be necessary to cut off the ends occasionally to maintain tight fit.

3. Voltage to tester -- voltage changes due to alternator charging rate at different speeds will affect analyzer reading. This is avoided by removing the field wire from the alternator while checking idle adjustment.

4. Equilibrium adjustment -- neoprene hose must be on the tester when making calibration settings to provide normal restriction to flow. Since moisture in the line affects readings,

Detailed Procedures (Continued)

4. (continued) make several readings with hose on and off at the condenser.

b. Procedure for reading idle air-fuel ratio

1. Observe all precautions listed above. Insert flexible exhaust probe line 30 inches into tail pipe. Connect condenser to probe and to instrument with neoprene tubing. Connect electrical leads to car battery.

2. Turn selector switch to BATTERY position and adjust BATTERY CALIBRATOR knob until meter reads on the SET line.

3. Turn selector switch to COMBUSTION position and adjust the COMBUSTION CALIBRATOR knob until meter reads on the SET LINE. Repeat this reading several times after allowing exhaust gas to flow through the tube, then disconnect at the condenser. Adjust to a stable reading.

4. Take a reading of idle air-fuel ratio and record on data sheet.

c. Flushing with Air

Allow instrument to run on air for 30 seconds before turning off.

2. Engine compression pressure

a. From a normally warm engine, remove all spark plugs.
b. Remove the air cleaner assembly.
c. Wire the choke in the open position.
d. Reinstall air cleaner.
e. Fasten the throttle in the fully open position.
f. Insert the pressure gauge into the spark plug opening.
g. Attach 12-volt converter power leads.
h. Crank the engine at constant speed (150 rpm) and record cylinder pressures.

APPENDIX 1. PACE PROPORTIONAL SAMPLER
CALIBRATION, CHECKOUT AND SAMPLING PROCEDURE

A. Calibration and Checkout

1. Carburetor Transducer Checkout

a. Connect carburetor transducer cable to rear of control module. Disconnect pressure lines from both sides of carburetor transducer. Attach electrical connecting cable between control and pneumatic modules of sampler. Plug in A.C. line cord.

b. Turn the following switches off: Pump, Servo, and Recorder. Turn the system to Standby, the Mode switch to Sample, Meter Select switch to Carburetor X10, and Power switch on.

c. Since there is no pressure on the transducer, the meter should read zero. If it does not, adjust the carburetor carrier demodulator Zero control until a zero reading is obtained (carrier-demodulator controls are mounted on the faces of the component plug-in units). The transducer must be in the same vertical position as it is during use.

d. Adjust integrator Bal. setting as follows: Insert voltmeter test leads into the test points on the face of the carburetor integrator plug-in. With zero signal from the transducer (both sides of transducer open to atmosphere), adjust integrator Bal. control to give a 3-volt signal on the voltmeter. Adjustment is correct when the 3-volt signal remains steady for several seconds.

e. Check and adjust an Ellison inclined-tube draft gage for level and zero. Attach tubing from pressure (low) side of draft gage through a plastic "tee" to "+" side of the carburetor transducer. The "-" side of the transducer remains open to the atmosphere. The third leg of the plastic "tee" is connected to the pressure bellows or a source of vacuum.

A. Calibration and Checkout (Continued)

f. Turn Meter Select switch to Carburetor X1 position. Adjust bellows to provide a pressure of 1.0 inch of water to transducer. Meter should read 50 on upper scale. If not, adjust carrier demodulator Span control to give 50 on the meter. Whenever the Span control setting is changed, zero setting must be rechecked (part 1 c.) and reset if it has changed. This is due to interaction of these two controls in the carrier demodulator circuit.

g. Reset counters on left side of control module to zero. Turn the system switch to Operate. Carburetor and Time counters will begin to count. Allow counters to operate for at least one minute (one minute is 60.0 on the Time counter). Calculate and record the counting rate of the Carburetor integrator. It should be 450 ± 20 counts/minute. If not, adjust the carburetor integrator Rate control to give the desired counting rate.

h. Check and record manometer reading (Δp) vs. integrator counting rate (counts/minute) at lower pressures of 0.80, 0.40, and 0.20 inches of water. These points should plot in a straight line through zero. If not, the transducer or some electronic component may be defective.

2. Exhaust Transducer Checkout

The exhaust transducer is checked automatically as part of the routine calibration described in the next section. A more precise check can be made occasionally by following the same general procedure outlined under Carburetor Transducer Checkout, but with adjustments made to the controls of the exhaust demodulator and integrator sections. Since the pressure fittings of the exhaust transducer are inaccessible with the transducer mounted in its normal position, such a checkout requires removal of the sample flow element and servo valve, transducer mounting screws, and pressure lines to the transducer. The transducer can then be moved to a point where the pressure fittings are accessible for connection to the draft gage and bellows.

3. System Checkout

a. Connect carburetor transducer cable to rear of control module. Disconnect pressure lines from carburetor transducer. Attach connecting cable between control and pneumatic modules of sampler. Plug in A.C. line cord.

b. Turn the following switches off: Pump, Servo, and Recorder. Turn the system to Standby, the Mode switch to Sample, Meter Select switch to Carburetor X10, and Power switch on.

c. Since there is no flow, meter should read zero. If it does not, adjust the carburetor carrier demodulator Zero control until a zero reading is obtained (carrier demodulator controls are mounted on the faces of the component plug-in units).

d. Repeat Step 3 c. with Meter Select switch in the Exhaust X10 position, adjusting the exhaust carrier demodulator Zero control.

e. Turn the Meter Select switch to the Difference X10 position. If the meter does not read zero, one or both demodulator zero adjustments will require additional adjustment (Steps 3 c. and 3 d. above).

f. Adjust carburetor integrator Bal. setting as follows: Insert voltmeter test leads into the test points in the face of the carburetor integrator plug-in. With zero signal from the transducer, adjust carburetor integrator Bal. control to give a 3-volt signal on the voltmeter. Adjustment is correct when the 3-volt signal remains steady for several seconds.

g. In a similar manner, adjust exhaust integrator Bal. control to give a steady 3-volt reading.

h. Insert voltmeter test leads into test points on face of servo amplifier plug-in. Voltage should be zero. If not, adjust Bal. control of servo amplifier until zero output is obtained. (Note: Be sure Mode switch is in Sample position when making this test.)

i. Using flexible tubing, connect carburetor transducer to Calibrate fittings on pneumatic module, (+) to High and (-) to Low.

3. System Checkout (Continued)

j. Turn H_2 Fill Rate adjusting screw full counter-clockwise. Plug dummy connector into Sample Bag fitting on side of pneumatic module. Turn Mode switch to H_2 Fill and sample selector switch to Sample. Turn Servo and Pump switches on.

k. Turn Meter Select switch to Carburetor X1 position. Slowly turn H_2 Fill Rate clockwise until meter reads 25 on the upper scale.

m. Turn Meter Select to Difference X10 position. Meter should read zero; if it does not, adjust exhaust carrier demodulator Span control to give zero reading. (Note: Exhaust carrier demodulator zero must be reset if span is changed because of interaction of span and zero controls.)

n. Turn system to Standby. Reset all counters to zero.

o. Turn system to Operate to check counting rate of carburetor and exhaust counters for about one minute. Turn system to Standby. Counters should agree within one count. If not, adjust exhaust integrator Counting Rate control until the Exhaust Counter counts at the same rate as the Carburetor Counter.

p. Readjust H_2 Fill Rate and check and record counting rates at other flows (meter readings) of 10, 20, 40, and 50. A difference of 3-4 counts/minute between the counters is permissible at maximum and minimum flows, but counters should count at the same rate at midrange (25 on meter). If not, exhaust integrator Counting Rate control may need additional adjustment.

q. As a check on the condition of the sampler, turn the H_2 Fill Rate control to produce a fill rate of 100. If 100 cannot be attained, the servo valve may be clogged with a sooty deposit, or the sampler bag box may have a leak at the glass windows or in a seam.

Carbon brushes in the electric motor should be inspected and replaced when necessary. It will be found that the brush nearest the servo valve wears several times more rapidly than the other one.

2. System Checkout (Continued)

q. (Continued)
To check the condition of the sample bag, turn Mode switch to transfer and plug in a water bubbler tester in place of a transfer bag. When evacuating the bag prior to N_2 fill during every test, leak test the bag during the final pump down.

B. Preparation and Sample Procurement

1. Preparation Procedures

a. Remove air cleaner from test car and store in car trunk.

b. Install air cleaner with attached flow element to be used with proportional sampler (be sure number on flow element corresponds with number on all parts of proportional sampler).

c. Charge a "nitrogen transfer" bag with a quantity of nitrogen.

d. Make certain that the sample collection bag is completely empty. If bag is not empty, plug dummy connector into Sample Bag fitting on side of pneumatic module and operate system on Transfer mode (with Power and Pump switches on) for several minutes to empty the bag. Use leak bubble tester for final pump-out.

e. Attach transfer bag containing nitrogen to Sample Bag fitting on side of pneumatic module. Turn Mode switch to N_2 Fill.

f. Reset counters (Exhaust, Carburetor, and Time) to zero. Turn sample selector switch to Sample, Pump and Servo switches to on, Meter Select to Exhaust X1, Recorder switch to Auto, and System switch to Operate. Time and exhaust counters will begin to count and nitrogen in the transfer bag will begin to flow into the sample bag. Rate of flow is indicated on the meter, and should be about 90 on the upper scale. If not, adjust the N_2 Fill Rate control until meter reads 90.

g. Allow nitrogen to flow until exhaust counter collects about double the number of expected sample counts, then turn System switch to Standby, and Pump and Servo switches to off. Collection bag is now charged with nitrogen, and the transfer bag can be removed from pneumatic module. Record exact number

B. Preparation and Sample Procurement (Continued)

1. Preparation Procedures (Continued)

g.
exhaust counts on data sheet.

h. Turn Mode switch to Sample, Meter Selector switch to Exhaust X1, and reset counters to zero. Sampler is now ready to operate. Engine can be started, and car driven to the beginning of the test route.

2. Sample Collection

a. Drive to the start of the test route.

b. Approximately one minute before reaching the start of the test route, turn Pump and Servo switches on. This will allow exhaust gas to flow through the sampler (but not into the sample bag), warming the sample lines and clearing them of any residual gas from earlier runs.

c. When the start of the test route is reached, turn system switch to Operate. Counters and temperature recorder will begin to operate, and the exhaust sample will begin to fill the sample bag. Meter Select switch can be left in Exhaust X1 position, or turned to Difference X10 or Carburetor X1 position during the time the sampler is operating. (Note: Be careful not to leave meter in Difference X10 position if sampler is not sampling -- meter may be "pegged" and damaged. Always move meter to Exhaust X1 or Carburetor X1 to protect meter when not sampling.)

d. When the end of the test route is reached, turn the system switch to Standby, and the Pump switch off. Sampling is now complete, and the car can be returned to the garage.

B. Sample Collection (Continued)

e. During the return trip, the exhaust sample in collection bag can be transferred to an external transfer bag as follows: Connect an empty "sample transfer" bag to Sample Bag fitting on side of pneumatic module. Turn Mode switch to Transfer, and Pump switch on, causing exhaust sample to flow into the transfer bag. When collection bag inside the steel case is nearly empty (collapsed), disconnect transfer bag and turn Pump off.

f. After returning to the laboratory, deliver the transfer bag to the analyst.

g. Completely evacuate sampler bag by final pump-out through a bubble tester.

h. Refill sample bag in proportional sampler with nitrogen as in Part IV-A and proceed for another run.

C. Additional Notes on Operation and Maintenance of Pace Proportional Sampler

1. Carburetor Transducer

If mounted on air cleaner, probably will need addition of a volume chamber (AC fuel filter can works okay) on high pressure side of transducer, plus 1-1/2 inch pieces of pipe cleaner in pressure lines on both sides of transducer to damp pressure oscillations from air pump.

2. Bubble tester required for detecting leaks in sample bag. (See sketch.)

3. Addition of a toggle-type valve to quickly vent pressure or vacuum in sample-bag drum is desirable.

4. Spare parts -- suggest acquisition of 2 pump motors, 1 pump, and set of electronic plug-in panels to keep as spares. Also will need pump motor brushes.

5. Exhaust sample line -- Nylon tubing is okay. Provide ice bath and water trap in sample line ahead of sampler. Use stainless steel probe in tailpipe.

6. Sampler Cleaning -- some dirt will collect in servo valve. Usual indication is insufficient flow in N_2 Fill mode. Valve can be disassembled for cleaning.

C. Additional Notes on Operation and Maintenance of Mass Proportional Sampler (Continued)

7. Sample bag punctures -- Inside of sample bag tank may have some sharp projections (from welds, bolt heads, sharp metal edges). Recommend covering sharp edges with plastic tape, or lining inside of tank with plastic or other protective material.

8. Temperature recorders -- likely are not calibrated correctly at factory, and should be recalibrated before being used. Also check time counter and recalibrate if necessary.

9. Intermittent malfunction of temp. recorder -- May be due to loose connecting plug at rear of recorder. Can usually be fixed by slightly bending male prongs to give snugger fit in female half of connection.

10. Carburetor transducer connecting cable to control module -- Handle with care! Avoid pinching or crimping between hood and firewall. An intermittent short or open circuit in cable means much down-time for trouble shooting.

11. If emissions in sample appear to be unusually high, may be indication that all of the nitrogen (for dilution of sample) is not going into sample bag in N_2 Fill mode. Possibility of malfunction of Solenoid V-, which could allow nitrogen to bypass sample bag.

12. Leak in sample line between end of tailpipe probe and sampler will spoil sample. Indication is unusually high O_2 in sample even when sample bag is okay. To check sample line for leaks, seal open end of tailpipe probe with tape, and operate sampler as follows: Check and reset Exhaust "zero" if necessary. With Mode switch in Sample position, turn Servo switch off, Pump switch on, and system switch to Operate. In this configuration, sampler will attempt to draw a sample through the sample line. With Meter switch in Exhaust X10 position, and Servo valve opened manually to about its half-open position, meter will initially indicate some flow until sample line is evacuated. If sample line is tight (no air leaks), meter will slowly drop toward zero indication. A stabilized indication of more than 2-3 scale units to the right of zero indicates a sizable air leak in sample line that should be corrected.

C. Additional Notes on Operation and Maintenance of Pace Proportional Sampler (Continued)

13. Meticulous care must be exercised in making leakproof connections between the laminar flow element and the carburetor. This includes all connections for PCV and air pump supply, as well as discharge air from the dump valve in the air pump where used. Any leaks will invalidate the air flow measurement.

14. Record the dial settings of the carrier demodulator span and integrator rate adjustment knobs after calibration. This will permit restoration of the setting in case they are turned inadvertently in subsequent zero or balance adjustment.

APPENDIX 4. INSTRUMENT CALIBRATION

NDIR and FID instruments must be turned on for a least one hour before calibration. As described in Part I (Start-up Operations), each NDIR instrument is checked for tuning, zero basis, and coarse zero. These calibrations are normally made at about 5-week intervals when arriving in each city.

A. Nondispersive Infrared (NDIR) and Flame Ionization Detector (FID)

1. Zero each instrument (with NDIR Gain set at 200 and FID at an Attenuation of X100) with a nitrogen flow at 12 ounces pressure and flow of 80 on flowmeter (flow rate and pressure are regulated and read on the panel mounted on trailer wall). Lock Zero controls.

2. Turn on all calibration gases and span gas. Connect Calibration Gas No. 4 to calibration gas line by means of quick-connect fitting.

3. Switch gas selector valve from Nitrogen to Calib. and adjust pressure and flow through instruments at 12 ounces and 80 on flowmeter.

4. Adjust Gain on each NDIR to give meter reading of 90. Lock Gain at this position.

5. Select FID Attenuation range for best readability.

6. Record meter readings obtained for Calibration Gas No. 4.

7. Switch to nitrogen to observe meter zero. If zero has changed, it will be necessary to repeat steps 1-6 after readjusting Zero.

8. Repeat steps 3, 5, 6 and 7 for Calibration Gases Nos. 3, 2, and 1 and for span gas. Do not change Gain on NDIR instruments. Select FID Attenuation for best readability for each gas. Run span gas several times, possibly between each calibration gas.

9. After final zero check, turn Gas Selector valve to Blank and turn off calibration gas cylinder valves.

10. Using appropriate concentration data from tags on calibration gas cylinders, plot calibration curves of meter reading vs. concentration for each instrument. Note: Curve for FID instrument should be linear. If not, replace 90-volt battery and check alignment of burner tip in burner chamber.

11. Record meter readings for each component in span gas. These readings should be posted on trailer panel for daily reference. Also record hydrocarbon concentration of span gas as read from calibration curve for FID plotted in Step 10.

B. Saltzman NO_2 (standardization of absorbing reagents)

1. Dilute $NaNO_2$ solution 1 to 10 with deionized distilled water to give a working concentration of 0.0203 grams/liter.

2. Place 0.2, 0.4, 0.6, 0.8, and 1.0 ml working concentrations in 25-ml measuring flasks. Fill each flask to the mark with absorbing reagent.

3. Allow 15 minutes for color development, shaking each flask several times.

4. After B and L Spectrophotometer has warmed up for at least 30 minutes, set zero with left knob. Set wavelength scale to 550. Fill an optical glass test tube with clear absorbing reagent, insert in holder with index mark aligned, and set meter needle to 0 absorbance using right knob. Recheck zero and 0 absorbance settings several times.

5. Transfer each of the five $NaNO_2$ solutions (from Step 2) to clean optical glass tubes. Read and record absorbance of each solution.

6. Prior to discarding the standardizing solutions, plot a curve with microliters of NO_2/ml reagent as ordinate versus absorbance as abscissa. (1 ml working concentration of $NaNO_2$ is equivalent to 0.4 microliters of NO/ml reagent.)

DAILY INSTRUMENT ADJUSTMENTS

Power to NDIR instrument electronics and heaters must be turned on for at least one hour before starting adjustments. Power to these circuits is normally on all the time while on location. Choppers must be on for at least 15 minutes. After FID analyzer has been ignited, as described in Part I-B, wait 30 minutes before checking out.

A. Nondispersive Infrared

1. Check Tuning on each NDIR instrument. If within 10% of value listed on the instrument data sheet, record value in log book. If out of the 10% limit, retune as outlined in instruction manual. Record new tuning value in log and on instrument data sheet.

2. Check zero bias on each NDIR by turning Gain to Zero. Meter should read zero. If not, adjust Zero Bias Control inside of instrument as follows:

> Turn Gain control to counterclockwise limit. (Amplifier-input signal is now zero. If setting of Bias Adjust is correct, amplifier-output signal should also be zero.) If meter reads zero, proceed with following steps. If meter does not read

A. Nondispersive Infrared (Continued)

2. (Continued)

zero, set Bias Adjust (R14) for zero reading on meter.

3. Check Zero Adjust on instrument panel. Set Gain to 200. Flow nitrogen through system at 12 ounces pressure and flow rate of 80 on the flowmeter. Zero meter with Zero Adj. If meter cannot be zeroed with this control, it will be necessary to adjust coarse zero shutter inside of instrument to a point that will allow the Zero Adj. to give a final zero adjustment.

Note: If necessary to open instrument in steps 1, 2, or 3, carry out remainder of these steps with instrument open. This will avoid having to reopen instrument if another adjustment is necessary. Before closing instrument, check zero to make certain zero shutter was not moved while replacing amplifier section.

B. Flame Ionization Detector

1. Check zero on FID analyser.

2. Flow nitrogen at 12 ounces pressure and flow rate of 80 on flowmeter. Set FID Attenuator at X100.

3. Adjust meter to zero with Zero Adj. Switch Attenuator to X300 and then to X1000. The zero should not shift appreciably between attenuation ranges. If meter cannot be zeroed with Zero Adj. replace the two 30-volt batteries.

4. If there is zero shift, proceed as follows:

   a. Remove one 10-volt zero-suppression battery from battery holder.
   b. Connect power cord to 115-volt A.C. line.
   c. Turn POWER Switch to ON position. Amplifier and sample pump (if provided) are now on.
   d. Turn ATTENUATOR SWITCH to X1000 position.
   e. Allow instrument to warm up for 5 minutes.
   f. Turn ATTENUATOR Switch from X1000 position to each of other 7 positions, in turn; then back to X1000 position. At each setting, meter should read with ± 0.5% of zero. If so, analyser is ready for operation. If meter does not read with ± 0.5% of zero for all ranges, allow analyser to warm up for about 30 minutes. If meter still does not read zero on all ranges, turn ATTENUATOR

B. Flame Ionization Detector (Continued)

f. (continued)
Switch to X1000 position; then obtain zero reading by adjusting VIBRODE ZERO Control, Figure 1 or 2. Again turn ATTENUATOR Switch to each position, to verify that each reading is zero.

C. Oxygen Analyzer

1. Check zero on oxygen analyzer.

2. With nitrogen flow at 12 ounces pressure and 80 flow rate, set meter to zero on 0-5% Range with Zero control.

3. Allow nitrogen to flow for at least one minute before adjusting. If meter will not zero, clean and recharge oxygen sensor. After recharging sensor, allow nitrogen to flow for 5-10 minutes and then check zero.

4. Check the 20.9% oxygen point. Turn Oxygen Analyzer to 0-25% range. Pump room air through analyzer at 12 ounces pressure and 80 flow rate. After one minute, adjust meter to read 20.9% using Calibrate control. If this cannot be adjusted, it is necessary to clean and recharge the sensor.

5. After recharging, repeat Steps 2, 3, and 4.

SAMPLE ANALYSIS

A. Instrumental

For each new sample, proceed as follows:

1. Install a clean filter paper with smooth side down.

2. Recheck zero on all instruments with a nitrogen flow of 12 ounces pressure and 80 flow rate. (Oxygen Analyzer on 0-5% Range, FID at X100 Attenuation, and NDIR's at 200 Gain).

3. Normalize all instruments with the span gas flowing at 12 ounces pressure and 80 flow rate. Adjust each NDIR Gain to give component meter reading obtained with the Span gas during calibration (see Step 11 in Part II-A). Record values. Set FID attenuation to give best readability, record reading and report Gain reading in instrument log.

4. Normalize Oxygen Analyzer by pumping room air through the instrument using sample air pump at 12 ounces and 80 flow. Have instrument set on 0-25% Range. After one minute, adjust meter to read 20.9% with Calibrate control.

A. Instrumental (Continued)

5. Switch back to nitrogen flow and check zero on all instruments (oxygen analyzer set on 0-5% Range).

6. Switch Gas Selector valve to Sample and turn on sample pump. Connect sample bag to Sample quick-connect on panel below instrument bench. After instrument meters come to an equilibrium, read and record values on plastic replacement dials. (The oxygen analyzer will take at least one minute to reach equilibrium, and select the best attenuation for readability on FID).

7. Switch back to nitrogen and turn off sample pump. Recheck zeros.

8. Switch to span gas and recheck span settings. To recheck oxygen analyzer span setting, remove sample bag and pump room air through instruments. Note: Whenever oxygen analyzer is spanned with room air, always set Range selector to 0-25% first.

9. Switch back to nitrogen and check zeros.

10. Turn off all gas flow (Gas Selector valve in Blank position).

11. For each new sample on the same day, repeat steps 1 thru 10.

12. At end of day, turn off choppers and close gas bottles.

B. Saltzman NO_x

1. Using thoroughly clean equipment, introduce 25 ml absorbing reagent into a 30-ml syringe fitted with a stainless steel adapter and valve. Expel all bubbles with tip raised vertically, adjust reagent to exactly 20 ml, and close valve. Attach hypodermic needle to valve.

2. Connect an adapter with a 4-in. length of tubing to the sample bag outlet fitting. Apply slight pressure to sample bag to expel sample -- a small weight placed on the bag works nicely to pressurize the bag. Cover tube end with a rubber septum to stop the gas flow. Insert hypodermic needle through septum, open valve, draw exactly 10 ml of sample gas into syringe, and close valve.

3. Allow at least 3 hours for color development. Shake syringe to distribute color evenly, then transfer solutions to an optical glass test tube for absorbance measurement. Adjust R and L Spectrophotometer settings as in Step 4 in Standardization.

4. Calculation for ppm NO_2.

$$\text{ppm } NO_2 = 1332^{*} \times \text{absorbance reading.}$$

* Value based on calibration.

```
// EXEC FORTRAN
C
C                                                                      T1
C     TRAILER  ... PROJECT 90261                                       T2
C                                                                      T3
      DOUBLE PRECISION CMAKE(10),CITY(10),RUN,BLANKS                   DP1
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                 DP2
      DIMENSION X(150),XLOW(50),XHIGH(50),HOLL(10,18)                  D1
      DIMENSION C(5),CAL(10),Y(80)                                     D2
      DIMENTION K(10),KLOW(10),KHIGH(10);KO(10),KSW(10)                D3
      DIMENSION LIST(52),IDATA(52)                                     D4
      COMMON BLANKS,RUN,A1,A3,CMAKE,CITY,XNAME,CARLIC                  C1
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALFX,ALFONE,ALF3           C2
      COMMON ICO,IPU,IPR,ITY,K,KLOW,KHIGH,KO,LIST,IDATA,KSW            C3
      COMMON I,J,JJ,JJJ,KA,NCOMM,KSBCSW,MR                             C4
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,M,KOPIES  C5
C
      EQUIVALENCE (Y(1),XHIGH(100))                                    E0A
      EQUIVALENCE (X(3),CPPCT),(X(5),ELMILE)                           E1
      EQUIVALENCE (X(6),ELMIN),(X(4),ODOM)                             E2
      EQUIVALENCE (X(7),CMPH)                                          E3
      EQUIVALENCE (X(8),DILRAT),(X(9),CAF),(X(11),SCFAIR),(X(12),SCFEXH) E4
      EQUIVALENCE (X(18),DEHCIR), (X(19),DEHCFI),(X(20),DECO)          E5
      EQUIVALENCE (X(21),DECO2), (X(22),DENOX), (X(23),DEO2)           E6
      EQUIVALENCE (X(13),DELP1),(X(24),DELP2),(X(35),DELP3)            E7
      EQUIVALENCE (X(14),CPM1),(X(25),CPM2),(X(36),CPM3)               E8
      EQUIVALENCE (X(15),CTN), (X(26),CTS), (X(37),CTC)                E9
      EQUIVALENCE (X(16),GTDFN),(X(27),GTDFS),(X(38),GTDFC)            E10
      EQUIVALENCE (X(17),GTCFN),(X(28),GTCFS),(X(39),GTCFC)            E11
      EQUIVALENCE (X(29),UEHCIR),(X(30),UEHCFI),(X(31),UECO)           E12
      EQUIVALENCE (X(32),UECO2),(X(33),UENOX),(X(34),UEO2)             E13
      EQUIVALENCE (X(40),EWHCIR),(X(41),EWHCFI),(X(42),EWCO)           E14
      EQUIVALENCE (X(43),EWCO2),(X(44),EWNOX),(X(10),EARAT)            E15
      EQUIVALENCE (X(45),RATIO)                                        E16
      EQUIVALENCE (X(46),TAMB),(X(47),PAMB),(X(48),HUMID)              E17
      EQUIVALENCE (X(49),CEARAT),(X(56),CPM)                           E17A
      EQUIVALENCE (X(50),CSCFEX),(X(51),CEHCIR),(X(52),CEHCFI)         E18
      EQUIVALENCE (X(53),CECO),(X(54),CECO2),(X(55),CENOX)             E19
      EQUIVALENCE (X(57),CWHCIR),(X(58),CWHCFI),(X(59),CWCO)           E20
      EQUIVALENCE (X(60),CWCO2),(X(61),CWNOX)                          E21
      EQUIVALENCE (X(62),DEHLO)                                        E22
      EQUIVALENCE (X(63),DEOLEF),(X(64),DEAROM),(X(65),DEHLOA)         E23
      EQUIVALENCE (X(66),UEOLEF),(X(67),UEAROM),(X(68),UEHLOA)         E24
      EQUIVALENCE (X(69),CEOLEF),(X(70),CEAROM),(X(71),CEHLOA)         E25
      EQUIVALENCE (X(72),EWOLEF),(X(73),EWAROM),(X(74),EWHLOA)         E26
      EQUIVALENCE (X(75),CWOLEF),(X(76),CWAROM),(X(77),CWHLOA)         E27
      EQUIVALENCE (X(78),AFCO2),(X(79),AFCO),(X(80),AF),(X(81),CPCAIR) E28
      EQUIVALENCE (X(82),PCTAIR),(X(83),UMPGAL),(X(84),CMPGAL)         E29
      EQUIVALENCE (X(85),CFFOIL),(X(86),EFFOIL)                        E30
      EQUIVALENCE (KO(1),MODE),(KO(2),MAGRAD),(KO(3),NOSUMM)           E31
      EQUIVALENCE (KO(4),NOREFU),(KO(5),ICHECK),(KO(6),KO6)            E32
      EQUIVALENCE (KO(7),KO7),(KO(8),KO8),(KO(9),IDIAGN)               E33
      EQUIVALENCE (KO(10),IPAUSE), (KSW(1),IBACK),(KSW(2),IOUT)        E34
C
C     PROGRAM  TRAILER ... PROJECT 90261
C     DATA PROCESSOR FOR PHS SURVEILLANCE ...IBM 360 VERSION
C
C     COMPILE DATE ... NOV. 8, 1968,  REVISED APRIL 28, 1969
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C
C     GEORGE W. THOMSON, RESEARCH AND DEVELOPMENT, ETHYL, DETROIT
C        BASED ON THE FEB. 21, 1967 VERSION
C
C       CHECKS THAT RUN CODES OF ALL RUN CARDS ARE ALIKE
C       CHECKS CARD ORDER
C       CHECKS THAT OBSERVED VALUES FALL IN A REASONABLE RANGE
C       RECOMPUTES ALL CALCD. VALUES
C       HANDLES SUBTRACTIVE COLUMN DATA
C
C     NOTE THAT COL. 1 - 12 OF THE CARD FOLLOWING CARD A
C        MUST EITHER BE BLANK OR HAVE SUBTRACTIVE COLUMN DATA
C
C     MODE, MAGBAD, NOSUMM, NOREFUR IN COL. 11,12,13,14 OF HEADER CARD
C
C     COL. 11 = 1 ... EDIT MODE ... NO OUTPUT
C               0 ... PROCESSING MODE
C
C     COL. 12 = 1 ... GO AHEAD EVEN IF A MAGNITUDE IS BAD
C               0 ... SKIP AND GO TO NEXT RUN
C
C        IF AN ESSENTIAL RUN DATUM IS OUTSIDE RANGE,  GO TO NEXT RUN
C           ALSO IF CARDS ARE OUT OF ORDER OR DATA OTHERWISE BAD
C
C     COL. 13 = 1 ... SKIP PRINT OF RUN SUMMARY TABLES
C     COL. 14 = 1 ... SKIP PUNCH OF REFURBISHED DECK
C     COL. 13 = 2 ... SKIP BOTH    ... STORE DATA ONLY
C
C     ..N2 SCALED.. MEANS DATA SCALED UP BY DILUTION RATIO
C        BASED ON THE NITROGEN COUNTS
C     ..CO/CO2 SCALED.. MEANS DATA SCALED UP BY DILUTION RATIO
C        BASED ON THE CO/CO2 CALCULATION
C
C     C=12.011, O=16, N=14.008, H=1.008          FACTOR = MOL.WT./385.319
C     HYDROCARBON....C H1.831......13.857             0.03596
C                    C O      .....28.011             0.07270
C                    C O2     .....44.011             0.11422
C                    N O2     .....46.008             0.11940
C
C     X(I) = (50)     CONSIDERED AS INPUT X VALUES
C     X(I) = (150)    AVAILABLE FOR STORAGE
C
C           A5                 RUN     5-ALPHAMERIC RUN NUMBER
C     X (2) F1.0  IDATA(1)             1-DIGIT SAMPLER NUMBER...KIND
C     X (3) F7.5               CFPCT   CUBIC FEET PER COUNT
C     X (4) F6.0  IDATA(2)     ODOM    ODOMETER READING,  MILES
C     X (5) F7.3               ELMILE  ELAPSED MILES
C     X (6) F7.2               ELMIN   ELAPSED MINUTES
C     X (7) F6.2               CMPH    CALCD. MILES PER HOUR
C     X (8) F6.3               DILRAT  CALCD. DILUTION RATIO
C     X (9) F6.2               AF      CALCD. AIR-FUEL RATIO
C     X(10) F6.3               EARAT   CALCD. MOLES EXHAUST/AIR
C     X(11) F6.1               SCFAIR  CALCD. SCF/MILE AIR
C     X(12) F6.1               SCFEXH  CALCD. SCF/MILE EXHAUST
C
C     X(13) F3.1               DELP1   INTEGRATOR CALIBRATION PRESSURES
C     X(24) F3.1               DELP2    THE THREE DELTA P ARE
```

```
C       X(35) F3.1             DELP3    USUALLY IN THE RATIO 1/2/4
C
C       X(14) F6.0  IDATA(3)   CPM1    INTEGRATOR CALIBRATION, COUNTS
C       X(25) F6.0  IDATA(8)   CPM2     PER MIN. AT THE THREE PRESSURES
C       X(36) F6.0  IDATA(13)  CPM3       X(13),X(24),X(35)
C
C       X(15) F6.0  IDATA(4)   CTN     NITROGEN   INTEGRATOR COUNTS
C       X(26) F6.0  IDATA(9)   CTS     SAMPLER    INTEGRATOR COUNTS
C       X(37) F6.0  IDATA(14)  CTC     CARBURETOR INTEGRATOR COUNTS
C
C       X(16) F6.1             GTOFN   NITROGEN   GAS TEMP. DEG F
C       X(27) F6.1             GTOFS   SAMPLER    GAS TEMP. DEG F
C       X(38) F6.1             GTOFC   CARBURETOR GAS TEMP. DEG F
C
C       X(17) F6.3             GTCFN   NITROGEN   GAS TEMP. CORRN. FACTOR
C       X(28) F6.3             GTCFS   SAMPLER    GAS TEMP. CORRN. FACTOR
C       X(39) F6.3             GTCFC   CARBURETOR GAS TEMP. CORRN. FACTOR
C
C       X(18) F6.0  IDATA(5)   DEHCIR  DIL. EXHAUST HC IR  OBS  PPMC
C       X(19) F6.0  IDATA(6)   DEHCFI  DIL. EXHAUST HC FID OBS  PPMC
C       X(20) F7.2             DECO    DIL. EXHAUST CO     OBS  PER CENT
C       X(21) F7.2             DECO2   DIL. EXHAUST CO2    OBS  PER CENT
C       X(22) F7.0  IDATA(7)   DENOX   DIL. EXHAUST NOX    OBS  PPM
C       X(23) F6.2             DEO2    DIL. EXHAUST O2     OBS  PER CENT
C
C       X(29) F6.0  IDATA(17)  UEHCIR  SAME AS X(18) - X(23)
C       X(30) F6.0  IDATA(18)  UEHCFI   BUT
C       X(31) F7.2             UECO       FOR
C       X(32) F7.2             UECO2        UNDILUTED EXHAUST
C       X(33) F7.0  IDATA(19)  UENOX          CALCULATED
C       X(34) F6.2             UEO2             SAME UNITS
C
C       X(40) F6.4             EWHCIR  SAME AS X(18) - X(22)
C       X(41) F6.4             EWHCFI   BUT CALCULATED
C       X(42) F7.4             EWCO       AS
C       X(43) F7.3             EWCO2        EMISSION WEIGHTS
C       X(44) F7.4             EWNOX          LB PER MILE
C
C       X(45) F6.3             RATIO   COUNT RATIO...SAMPLER/CARBURETOR
C
C       X(46)       IDATA(15)  TAMB    AMBIENT AIR TEMPERATURE..DEG. F
C       X(47)                  PAMB    AMBIENT AIR PRESSURE..IN. HG
C       X(48)       IDATA(16)  HUMID   PER CENT RELATIVE HUMIDITY
C
C       X(50) TO X(61)       ..CO/CO2 SCALED.. VALUES    SEE EQUIVALENCES
C       X(62) TO X(77)       SUBTRACTIVE COLUMN VALUES   SEE EQUIVALENCES
C
C
C                     K(1)  CODE FOR CITY. . . . . . .1 TO 3
C                     K(2)  CODE FOR VISIT . . . . . .1 TO 9
C                     K(3)  CODE FOR DEVICE . . . . . .1 TO 9
C                     K(4)  CODE FOR CAR MAKE . . . . .1 TO 9
C                     K(5)  CODE FOR SAMPLER. . . . . .1 TO 6
C                     K(6)  CODE FOR CAR NUMBER . . . .1 TO 99
C                     K(7)  CODE FOR REPEAT RUN . . . .1 TO 9
C                     K(8)  CARD SET NUMBER     . . . .0 ONLY
C                     K(9)  CARD NUMBER IN SET  . . . .1 TO 9
```

```
C
C
C
C     TRAILER ... MAINLINE
C
      DEFINE FILE  7 (1000,60,U,IDELS)
C                                                    NO DATA STORED IN THIS FILE
      DEFINE FILE 12 (16200,133,E,M)
      DEFINE FILE 13 (3000,207,U,IDISK)
      DEFINE FILE 14 (3000,20,U,IDICT)
C
C     FILE  7  DELS-STORE     CYL.   1 -  10   1000 RECORDS   60  WORDS
C     FILE 12  OUTPUT         CYL.  11 - 100  16200 RECORDS   133 CHAR.
C                                                 ABOUT 300 RUNS
C     FILE 13  DATA           CYL. 101 - 177   3000 RECORDS   207 WORDS
C     FILE 14  DICTIONARY     CYL. 178 - 191   3000 RECORDS   20  WORDS
C
C     BECAUSE OF THE USE OF REREAD,  FILE 12 MUST BE RETRIEVED
C        BY A SEPARATE PROGRAM .... PRINT12
C
      CALL REREAD
    1 CALL OVRLY(1)
C                               TLOAD1    PRELOADS
   20 IBACK = -1
   22 CALL OVRLY(2)
C                               TLOAD2    DATA CARDS
      IF (IDIAGN) 50,50,24
   24 CALL TDIAG(1)
   50 IF (IOUT) 55,60,55
C                               IOUT  IS THE EXIT FLAG
   55 IF (ICHECK) 850,100,850
C                               ICHECK  = 1 FOR CHECK OF STORED RUNS
   60 IBACK = 0
      CALL OVRLY(3)
C                               TTEST     TEST DATA FOR VALIDITY
   64 IF (IBACK) 22,66,22
   66 IF (MODE)  96,90,22
C                               96 IS TO THE DUMMY
   90 CALL OVRLY(4)
C                               TCALC     CALCULATIONS
      IF (IDIAGN) 212,212,110
  110 CALL TDIAG(1)
  212 IF (NOSUMM) 214,214,216
  214 WRITE (IPR,9214)
 9214 FORMAT ('1')
  216 WRITE (IPR,9216) RUN,IDISK
 9216 FORMAT (T100,' RUN  ',A5,'   REC. NO.',I5)
  112 IF (NOSUMM - 1) 114,730,763
  114 IF (KOPIES - 1) 116,116,124
  116 CALL OVRLY(15)
C                               TSUMM3    RUN-SUMMARY TABLE  PRINTED
      CALL OVRLY(16)
C                               TSUMM4    RUN-SUMMARY TABLE  PRINTED
      GO TO 730
  124 CALL OVRLY(5)
C                               TSUMM1    RUN-SUMMARY TABLE  STORED
      CALL OVRLY(6)
```

```
C                              TSUMM2    RUN-SUMMARY TABLE  STORED
  730 IF (NOREFU) 760,740,760
  740 CALL OVRLY(7)
C                              TREFUR    REFURBISHED DATA DECK
  760 CALL OVRLY(8)
C                              TSTORE    STORE DATA ON DISK
      GO TO 22
C                              CHECK STORED DATA
  850 CALL TDIAG(3)
  100 IF (NOSUMM) 101,101,20
  101 IF (KOPIES - 1) 20,20,102
  102 JJJ = N - 1
C                                        LAST RECORD WRITTEN ON OUTPUT FILE
      WRITE (12'1,910) JJJ,KOPIES
  910 FORMAT (2I8,A1,F1.0)
      CALL EXIT
C
C
   98 B = 2.0
      B = SQRT(EXP(ALOG(B**B + B**2)))
      READ (1,910)I,I,B,B
      PAUSE 999
      CALL EXIT
      END
/*
```

```
// EXEC FORTRAN
      SUBROUTINE   FLOAD1
C
C     TRAILER ... PROJECT 90261                                          F1
C                                                                        F2
      DOUBLE PRECISION CNAME(10),CITY(10),RUN,BLANK8                     F3
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                   DP1
      DIMENSION X(150),XLOW(150),XHIGH(150),HOLL(10,10)                  DP2
      DIMENSION C(5),CAL(10),Y(100)                                      D1
      DIMENSION K(10),KLOW(10),KHIGH(10),KD(10),KSW(10)                  D2
      DIMENSION LIST(52),IDATA(52)                                       D3
      COMMON BLANK8,RUN,A1,A3,CNAME,CITY,XNAME,CARLIC                    D4
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALFA,ALFONE,ALF1             C1
      COMMON ICD,IPU,IPR,ITY,K,KLOW,KHIGH,KD,LIST,IDATA,KSW              C2
      COMMON I,J,JJ,JJJ,KA,NCOMM,KSRCSW,MX                               C3
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,N,KOPIES    C4
C                                                                        Y
      EQUIVALENCE (Y(1),XHIGH(51))                                       E0A
      EQUIVALENCE (X(3),CPPET),(X(5),ELPILE)                             E1
      EQUIVALENCE (X(6),FLMIN),(X(4),DUON)                               E2
      EQUIVALENCE (X(7),CMPH)                                            E3
      EQUIVALENCE (X(8),OILRAT),(X(9),CAF),(X(11),SCPAIR),(X(12),SCPEXH) E4
      EQUIVALENCE (X(18),DEHCIR),(X(19),DEHCFI),(X(20),DECO)             E5
      EQUIVALENCE (X(21),DECO2), (X(22),DENOX), (X(23),DEO2)             E6
      EQUIVALENCE (X(13),DELP1),(X(24),DELP2),(X(35),DELP3)              E7
      EQUIVALENCE (X(14),CPM1),(X(25),CPM2),(X(36),CPM3)                 E8
      EQUIVALENCE (X(15),CTN), (X(26),CTS), (X(37),CTC)                  E9
      EQUIVALENCE (X(16),GTOPN),(X(27),GTOPS),(X(38),GTOPC)              E10
      EQUIVALENCE (X(17),GTCPN),(X(28),GTCPS),(X(39),GTCPC)              E11
      EQUIVALENCE (X(29),UEHCIR),(X(30),UEHCFI),(X(31),UECO)             E12
      EQUIVALENCE (X(32),UECO2),(X(33),UENOX),(X(34),UEO2)               E13
      EQUIVALENCE (X(40),EWHCIR),(X(41),EWHCFI),(X(42),EWCO)             E14
      EQUIVALENCE (X(43),EWCO2),(X(44),EWNOX),(X(10),EARAT)              E15
      EQUIVALENCE (X(45),RATIO)                                          E16
      EQUIVALENCE (X(46),TAMB),(X(47),PCOR),(X(48),HUMID)                E17
      EQUIVALENCE (X(49),CEARAT),(X(56),CPM)                             E17A
      EQUIVALENCE (X(50),CSCFEX),(X(51),CEHCIR),(X(52),CEHCFI)           E18
      EQUIVALENCE (X(53),CECO),(X(54),CECO2),(X(55),CENOX)               E19
      EQUIVALENCE (X(57),CWHCIR),(X(58),CWHCFI),(X(59),CWCO)             E20
      EQUIVALENCE (X(60),CWCO2),(X(61),CWNOX)                            E21
      EQUIVALENCE (X(62),DEHLD)                                          E22
      EQUIVALENCE (X(63),DEOLEF),(X(64),DEAROM),(X(65),DEHLDA)           E23
      EQUIVALENCE (X(66),UEOLEF),(X(67),UEAROM),(X(68),UEHLDA)           E24
      EQUIVALENCE (X(69),CEOLEF),(X(70),CEAROM),(X(71),CEHLDA)           E25
      EQUIVALENCE (X(72),EWOLEF),(X(73),EWAROM),(X(74),EWHLDA)           E26
      EQUIVALENCE (X(75),CWOLEF),(X(76),CWAROM),(X(77),CWHLDA)           E27
      EQUIVALENCE (X(78),AFCO2),(X(79),AFCO),(X(80),AF),(X(81),CPCAIR)   E28
      EQUIVALENCE (X(82),PCTAIR),(X(83),UMPGAL),(X(84),CMPGAL)           E29
      EQUIVALENCE (X(85),CFFOIL),(X(86),EFFOIL)                          E30
      EQUIVALENCE (KD(1),MODE),(KD(2),MAGBAD),(KD(3),NOSUMM)             E31
      EQUIVALENCE (KD(4),NOREFU),(KD(5),ICHECK),(KD(6),KD6)              E32
      EQUIVALENCE (KD(7),KD7),(KD(8),KD8),(KD(9),IDIAGN)                 E33
      EQUIVALENCE (KD(10),IPAUSE), (KSW(1),IBACK),(KSW(2),IOUT)          E34
      CALL REREAD
C
C     PRELIMINARIES
C
```

```
    1 ICD=1
      IPU=2
      IPR=3
      ITY=15
      C(1) = 0.03596E-6
      C(2) = 0.03596E-5
      C(3) = 0.07270E-2
      C(4) = 0.11522E-2
      C(5) = 0.11940E-6
C
C     PRELOAD ALPHABETICS
C
    8 READ (ICD,908) (A1(I), I=1,9),
     1                 ALF3,ALFONE,ALFX, (A3(I),I=1,6),BLANK8,BLANK1
  908 FORMAT(9(2X,A6),5X,3A1/6(2X,A6),A8,A1,23X)
C
C     PRELOAD OF SUBSCRIPTS FOR INTEGER DATA     I3 FORMAT
C        LIST( ) IS SUBSCRIPT FOR X( )   IDATA(I) = X(LIST(J))
C
C 2  4 14 15 18 19 22 25 26 51 52 55 36 37 46 48 29 30 33 63 64 65 66 67 68 69
C70 71
C
  914 READ (ICD,914) (LIST(I), I=1,52)
  914 FORMAT (26I3,2X)
C
C
C     ****************************************************************
C
C     LOAD OF BASIC DATA
C
C     ENDER FOR EACH LOAD SECTION IS A BLANK CARD OR -1 IN COL. 9,10
C        NOTE THE HIGH UPPER DO INDEX
C
C     DEBUG LIMIT LOAD
C
 7700 DO 7704 JJ = 1,150
      XNAME(JJ) = BLANK8
      X(JJ) = 0.0
      IF (JJ - 52) 7701,7701,7704
 7701 IDATA(JJ) = 0
      IF (JJ - 50) 7702,7702,7704
 7702 XLOW(JJ) = 0.0001
      XHIGH(JJ) = 99999.0
 7704 CONTINUE
C
      DO 7706 JJ = 1,10
      CNAME(JJ) = BLANK8
      CITY (JJ) = BLANK8
      CAL(JJ) = 0.0
      KSW(JJ) = 0
      KD(JJ) = 0
      K(JJ) = 0
      KLOW(JJ) = 1
 7706 KHIGH(JJ) = 9
      KHIGH(6)  = 99
      KLOW(8) = 0
      KHIGH(8) = 0
      KDISK = 1
      KDICT = 1
C
C     LOAD LIST OF CAR NAMES
C
 7800 DO 7801 JJ = 1,199
      READ (ICO,9800) I
      IF(I) 7802,7802,7801
 7801 READ  (99,9800) I,CMAKE(I)
C                                   THIS IS REREAD
 9800 FORMAT(I10,5X,A5)
C
C     LOAD LIST OF CITY NAMES
C
 7802 DO 7805 JJ=1,199
      READ (ICO,9800) I
      IF(I) 7806,7806,7805
 7805 READ  (99,9805) I,CITY(I)
 9805 FORMAT (I10,6X,A8)
C
C     LOAD NAMES FOR PERTINENT X( ) VARIABLES
C
 7806 DO 7855 JJ=1,199
      READ (ICO,9850) I
      IF (I) 7900,7900,7855
 7855 READ  (99,9850) I,XNAME(I)
 9850 FORMAT (I10,10X,A8)
C
C     LOAD LAMINAR ELEMENT CALIBRATION FACTORS
C       FLOW, CFM, AT 0.4 IN. WATER DELTA P
C
 7900 DO 7901 JJ = 1,199
      READ (ICO,902) I
      IF(I) 7902,7902,7901
 7901 READ  (99,902) I,CAL(I)
C
C     LOAD LIMIT VECTORS FOR EACH X( ) INPUT VARIABLE
C
 7902 DO 8003 JJ=1,199
  902 FORMAT(I10,2F20.5)
      READ (ICO,902) I
      IF (I) 8004,8004,8003
 8003 READ  (99,902) I,XLOW(I),XHIGH(I)
C
C     LOAD LIMIT VECTORS FOR EACH K( ) INPUT VARIABLE
C
 8004 DO 8006 JJ=1,199
      READ (ICO,905) I
      IF(I) 8007,8007,8006
 8006 READ  (99,905) I,KLOW(I),KHIGH(I)
  905 FORMAT(3I10)
 8007 RETURN
      END
/*
```

```
// EXEC FORTRAN
      SUBROUTINE   TLOAD2
C                                                                           T1
C     TRAILER  ... PROJECT 90261                                            T2
C                                                                           T3
      DOUBLE PRECISION CMAKE(10),CITY(10),RUN,BLANK8                        DP1
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                      DP2
      DIMENSION X(150),XLOW(50),XHIGH(50),HOLL(10,18)                       D1
      DIMENSION C(5),CAL(10),Y(180)                                         D2
      DIMENSION K(10),KLOW(10),KHIGH(10),KD(10),KSW(10)                     D3
      DIMENSION LIST(52),IDATA(52)                                          D4
      COMMON BLANK8,RUN,A1,A3,CMAKE,CITY,XNAME,CARLIC                       C1
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALFX,ALFONE,ALF3                C2
      COMMON ICD,IPU,IPR,ITY,K,KLOW,KHIGH,KD,LIST,IDATA,KSW                 C3
      COMMON I,J,JJ,JJJ,KA,NCOMM,KSBCSW,MX                                  C4
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,M,KOPIES       C5
C                                                                           E
      EQUIVALENCE (Y(1),XHIGH(51))                                          E0A
      EQUIVALENCE (X(3),CPPCT),(X(5),ELMILE)                                E1
      EQUIVALENCE (X(6),ELMIN),(X(4),ODOM)                                  E2
      EQUIVALENCE (X(7),EMPH)                                               E3
      EQUIVALENCE (X(8),OILRAT),(X(9),CAF),(X(11),SCFAIR),(X(12),SCFEXH)    E4
      EQUIVALENCE (X(18),DEHCIR),(X(19),DEHCFI),(X(20),DECO)                E5
      EQUIVALENCE (X(21),DECO2), (X(22),DENOX), (X(23),DEO2)                E6
      EQUIVALENCE (X(13),DELP1),(X(24),DELP2),(X(35),DELP3)                 E7
      EQUIVALENCE (X(14),CPM1),(X(25),CPM2),(X(36),CPM3)                    E8
      EQUIVALENCE (X(15),CTN), (X(26),CTS), (X(37),CTC)                     E9
      EQUIVALENCE (X(16),GTOFN),(X(27),GTOFS),(X(38),GTOFC)                 E10
      EQUIVALENCE (X(17),GTCFN),(X(28),GTCFS),(X(39),GTCFC)                 E11
      EQUIVALENCE (X(29),UEHCIR),(X(30),UEHCFI),(X(31),UECO)                E12
      EQUIVALENCE (X(32),UECO2),(X(33),UENOX),(X(34),UEO2)                  E13
      EQUIVALENCE (X(40),EWHCIR),(X(41),EWHCFI),(X(42),EWCO)                E14
      EQUIVALENCE (X(43),EWCO2),(X(44),EWNOX),(X(10),EARAT)                 E15
      EQUIVSLENCE (X(45),RATIO)                                             E16
      EQUIVALENCE (X(46),TAMB),(X(47),PAMB),(X(48),HUMID)                   E17
      EQUIVALENCE (X(49),CEARAT),(X(56),CPK)                                E17A
      EQUIVALENCE (X(50),CSCFEX),(X(51),CEHCIR),(X(52),CEHCFI)              E18
      EQUIVALENCE (X(53),CECO),(X(54),CECO2),(X(55),CENOX)                  E19
      EQUIVALENCE (X(57),CWHCIR),(X(58),CWHCFI),(X(59),CWCO)                E20
      EQUIVALENCE (X(60),CWCO2),(X(61),CWNOX)                               E21
      EQUIVALENCE (X(62),DEHLO)                                             E22
      EQUIVALENCE (X(63),DEOLEF),(X(64),DEAROM),(X(65),DEHLOA)              E23
      EQUIVALENCE (X(66),UEOLEF),(X(67),UEAROM),(X(68),UEHLOA)              E24
      EQUIVALENCE (X(69),CEOLEF),(X(70),CEAROM),(X(71),CEHLOA)              E25
      EQUIVALENCE (X(72),EWOLEF),(X(73),EWAROM),(X(74),EWHLOA)              E26
      EQUIVALENCE (X(75),CWOLEF),(X(76),CWAROM),(X(77),CWHLOA)              E27
      EQUIVALENCE (X(78),AFCO2),(X(79),AFCO),(X(80),AF),(X(81),CPCAIR)      E28
      EQUIVALENCE (X(82),PCTAIR),(X(83),UMPGAL),(X(84),CMPGAL)              E29
      EQUIVALENCE (X(85),CFFOIL),(X(86),EFFOIL)                             E30
      EQUIVALENCE (KD(1),MODE),(KD(2),MAGRAD),(KD(3),NOSUMM)                E31
      EQUIVALENCE (KD(4),NOREFU),(KD(5),ICHECK),(KD(6),KD6)                 E32
      EQUIVALENCE (KD(7),KD7),(KD(8),KD8),(KD(9),IDIAGN)                    E33
      EQUIVALENCE (KD(10),IPAUSE), (KSW(1),IBACK),(KSW(2),IOUT)             E34
      CALL REREAD
C
      IF (IBACK) 20,920,26
C
```

```
C     CONTROL CARD ... CODES KD(1) TO KD(10) IN COL. 11 - 20
C        MUST HAVE 99 IN COL. 79,80
C
C     COL. 21-25  OPEN
C     COL. 26-30  OPEN
C     COL. 31-35  KDISK      PRESET FOR IDISK
C                                 KDICT SET EQUAL TO KDISK
C                            DEFAULTED TO 1
C     COL. 36-40  OPEN
C     COL. 41-45  KOPIES     NUMBER OF COPIES OF TABLES
C     COL. 46-50  KSW(8)
C     COL. 51-55, 56-60 ARE KSW(9),(10)
C
C
   20 READ (ICD,920) (KD(I),I=1,10),JJ,JJ,KDISK,JJ,KOPIES,
     1      (KSW(I), I=8,10),KODE
  920 FORMAT (10X,10I1,8I5,18X,I2)
      IMESS = IPR
C                            IMESS FOR ERROR MESSAGES, ETC.
      IF (KODE - 99) 524,422,524
C
C     LOAD FIRST AND LAST RECORD NO. FOR DIAGNOSTIC OUTPUT
C     THE DATA MUST HAVE BEEN LOADED
C
  422 IF (KD(8)) 525,525,423
  423 READ (ICD,9423) KSW(6),KSW(7)
 9423 FORMAT (2I10)
      CALL TOTAU(4)
      PAUSE
      GO TO 423
C
C
  524 WRITE (IMESS,924) KODE
  924 FORMAT (I3,' NOT 99 ... CONTROL CARD OUT OF ORDER')
      GO TO 20
C
  525 IF (KDISK) 526,526,527
  526 KDISK = 1
  527 KDICT = KDISK
  619 IF (KOPIES) 620,620,621
  620 KOPIES = 1
  621 IF (MODE) 530,530,622
  622 IF (KD6) 530,530,624
  624 IMESS = ITY
C                            TYPED MESSAGES IN EDIT MODE IF KD6 = 1
C
C                            INITIALIZE FOR DISK RECORDS
  530 IDISK = KDISK
      IDICT = KDICT
      M = 2
      IOUT = 0
C                            IOUT = 1 WHEN X-ENDER CARD COMES IN
      NRUNS = 0
C                            STORED RUN COUNTER
C
C
C     READ THE DATA CARDS
C
```

```
C     READ DATA CARD 01
C       WITH TEST IF RUN NO. IS IN COL. 1-5 OR 2-6
C
  528 READ (ICD,915) B,KODEA,KODEC
  915 FORMAT (A1,69X,I9,I1)
C
C     THE DATA ENDER HAS X IN COL. 1
C
      IF (B - ALFX) 432,430,432
  430 IOUT = 1
      RETURN
C
  432 IF (B - BLANK1) 520,516,520
C                                                         THIS IS REREAD
  516 READ (99,916) RUN,(X(I),I=2,12),(K(I),I=1,9)
  916 FORMAT(1X,A5,F1.0,F7.3,F6.0,F7.3,F7.2,2(F6.2,F6.3),2F6.1,
     1        5I1,I2,3I1)
      GO TO 522
  520 READ (99,820) RUN,(X(I),I=2,12),(K(I),I=1,9)
  820 FORMAT  (A5,F2.0,F7.3,F6.0,F7.3,F7.2,F6.2,F6.3,F6.2,F6.3,2F6.1,
     1          5I1,I2,3I1)
C
  522 IF (MODE) 921,921,627
C
  627 WRITE (IMESS,927) RUN
  927 FORMAT (T100,'RUN  ',A5)
C
  921 IF (10*K(8) + KODEC - 1) 22,28,22
C
   22 WRITE (IMESS,922) KODEA,KODEC
  922 FORMAT (' CARD ',I9,I1,' OUT OF ORDER  ...  ABORT RUN')
C
C     ABORT RUN
C
   24 IF(KODEC - 9) 25,26,25
   25 READ (ICD,925) KODEC
  925 FORMAT(79X,I1)
      IF(KODEC - 9) 25,26,25
   26 WRITE (IMESS,926) RUN
  926 FORMAT (' RUN ',A5,' SKIPPED')
      GO TO 528
C
   28 KA = KODEA
C
C     READ CARD 02
C
   30 READ (ICD,930) (X(I),I=13,23),KODEA,KODEC
  930 FORMAT(F3.1,F4.0,F6.0,6X,F6.1,F6.3,2F6.0,2F7.2,F7.0,F6.2,I9,I1)
      IF(KODEC - 2) 22,34,22
   34 IF(KODEA - KA) 22,40,22
C
C     READ CARD 03
C
   40 READ (ICD,930) (X(I),I=24,34),KODEA,KODEC
      IF(KODEC - 3)  22,44,22
   44 IF(KODEA - KA) 22,50,22
C
```

```
C      READ CARD 04
C
   50 READ (ICD,950) (X(I),I=35,45),KODEA,KODEC
  950 FORMAT(F5.1,F4.0,F6.0,6X,F6.1,F6.3,2F6.4,F7.4,F7.3,F7.4,F6.2,
     1          I9,I1)
   52 IF(KODEC - 4)  22,54,22
   54 IF(KODEA - KA) 22,99,22
   99 NCOMM = 3
C
C      READ CARD 05
C
   11 READ (ICD,9001)(HOLL(1,I), I=1,18),KODEA,KODEC
 9001 FORMAT (1X,A1,17A4,I9,I1)
      READ (99,9011) CARLIC
 9011 FORMAT (1X,A7)
   12 IF(KODEC - 5)  22,13,22
   13 IF(KODEA - KA) 22,14,22
C
C      READ CARD 06
C
   14 READ (ICD,9001)(HOLL(2,I), I=1,18),KODEA,KODEC
   16 IF(KODEC - 6)  22,17,22
   17 IF(KODEA - KA) 22,101,22
C
  101 READ (99,8101) TAMB,PAMB,HUMID
 8101 FORMAT(22X,F3.0,1X,F5.2,1X,F3.0)
C
C      READ EITHER CARD 07 OR 09
C          WITH SUBTRACTIVE COLUMN DATA IF ANY IN COL. 2 - 12
C          IF NONE,  COL. 2 - 12 MUST BE BLANK
C
C                                   KSBCSW = 0 :: NO SUBTRACTIVE COLUMN DATA
C                                            1 ::    SUBTRACTIVE COLUMN DATA
      KSBCSW = 1
  175 READ (ICD,9001)(HOLL(3,I), I=1,18),KODEA,KODEC
      IF (KODEA - KA) 22,202,22
  202 IF (KODEC - 7) 22,206,204
  204 IF (KODEC - 9) 22,175,22
  206 READ (99,9206) B
 9206 FORMAT (1X,A1,68X,I9,I1)
      IF (B - BLANK1) 208,174,208
  208 IF (B - ALFONE) 22,210,22
  210 READ (ICD,9210) JJJ,KODEA,KODEC
 9210 FORMAT (1X,I1,68X,I9,I1)
      IF (KODEA - KA) 22,212,22
  212 IF (KODEC - 7) 22,214,22
  214 IF (JJJ - 2) 22,216,17
  216 READ (99,9216) DEOLEF,DEHLOA
 9216 FORMAT (2X,F5.0,5X,F5.0)
      IF (DEHLOA) 1216,1216,1217
 1216 KSBCSW = 0
      GO TO 217
 1217 DEHLO = DEHEFI - DEOLEF
  217 JJ = 3
C
C
C      ALLOWANCE FOR POSSIBLE THIRD CARD IN THE 07 SET
```

```
C
  218 READ (ICD,9206) B,KODEA,KODEC
      IF (KODEA - KA) 22,220,22
  220 IF (KODEC - 7) 22,222,224
  222 IF (B - ALF5) 22,18,22
  224 READ (99,9001) (HOLL(3,I), I=1,18)
      JJ = 4
  226 IF (KODEC - 9) 18,60,22
C
  174 JJ = 4
  175 READ (99,8175) DEHLO,DEHLOA
 8175 FORMAT(I2,F5.0,F6.0)
      IF(DEHLO) 177,177,176
  176 IF(DEHLOA) 177,177,178
  177 KSBCSW = 0
  178 IF(KODEC - 9)  18,60,22
C
C     READ UP TO 7 MORE COMMENT CARDS
C            LAST CARD CODED 9 IN COL. 80
C                  OTHERS CAN HAVE 0 TO 8
C
   18 DO 122 JJJ = JJ,10
      READ (ICD,9001)(HOLL(JJJ,I), I=1,18),KODEA,KODEC
      IF (KODEA - KA) 22,120,22
  120 IF(KODEC - 9)  122,123,22
  122 CONTINUE
  123 NCOMM = JJJ
C
C
C
C     THE DATA CARDS ARE IN ORDER AND HAVE THE SAME RUN CODES
C        THERE MAY BE SOME COMMENT CARDS FOLLOWING
C
   60 RETURN
      END
/*
```

```
// EXEC FORTRAN
      SUBROUTINE   TTEST
C                                                                       T1
C     TRAILER ... PROJECT 90261                                         T2
C                                                                       T3
      DOUBLE PRECISION CMAKE(10),CITY(10),RUN,BLANKB                    DP1
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                  DP2
      DIMENSION X(150),XLOW(50),XHIGH(50),HOLL(10,18)                   D1
      DIMENSION C(5),CAL(10),Y(130)                                     D2
      DIMENSION K(10),KLOW(10),KHIGH(10),KD(10),KSW(10)                 D3
      DIMENSION LIST(52),IDATA(52)                                      D4
      COMMON BLANKB,RUN,A1,A3,CMAKE,CITY,XNAME,CARLIC                   C1
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALFX,ALFONE,ALF3            C2
      COMMON ICD,IPU,IPR,ITY,K,KLOW,KHIGH,KD,LIST,IDATA,KSW             C3
      COMMON I,J,JJ,JJJ,KA,NCOMM,KSRCSW,MX                              C4
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,M,KOPIES   C5
C                                                                       E
      EQUIVALENCE (Y(1),XHIGH(51))                                      E0A
      EQUIVALENCE (X(3),CFPCT),(X(5),ELMILE)                            E1
      EQUIVALENCE (X(6),ELMIN),(X(4),ODGM)                              E2
      EQUIVALENCE (X(7),CMPH)                                           E3
      EQUIVALENCE (X(8),DILRAT),(X(9),CAF),(X(11),SCFAIR),(X(12),SCFEXH) E4
      EQUIVALENCE (X(18),DEHCIR),(X(19),DEHCFI),(X(20),DECO)            E5
      EQUIVALENCE (X(21),DECO2), (X(22),DENOX), (X(23),DEO2)            E6
      EQUIVALENCE (X(13),DELP1),(X(24),DELP2),(X(35),DELP3)             E7
      EQUIVALENCE (X(14),CPM1),(X(25),CPM2),(X(36),CPM3)                E8
      EQUIVALENCE (X(15),CTN), (X(26),CTS), (X(37),CTC)                 E9
      EQUIVALENCE (X(16),GTDFN),(X(27),GTDFS),(X(38),GTDFC)             E10
      EQUIVALENCE (X(17),GTCFN),(X(28),GTCFS),(X(39),GTCFC)             E11
      EQUIVALENCE (X(29),UEHCIR),(X(30),UEHCFI),(X(31),UECO)            E12
      EQUIVALENCE (X(32),UECO2),(X(33),UENOX),(X(34),UEO2)              E13
      EQUIVALENCE (X(40),EWHCIR),(X(41),EWHCFI),(X(42),EWCO)            E14
      EQUIVALENCE (X(43),EWCO2),(X(44),EWNOX),(X(10),EARAT)             E15
      EQUIVALENCE (X(45),RATIO)                                         E16
      EQUIVALENCE (X(46),TAMB),(X(47),PAMB),(X(48),HUMID)               E17
      EQUIVALENCE (X(49),CEARAT),(X(56),CPM)                            E17A
      EQUIVALENCE (X(50),CSCFEX),(X(51),CEHCIR),(X(52),CEHCFI)          E18
      EQUIVALENCE (X(53),CECO),(X(54),CECO2),(X(55),CENOX)              E19
      EQUIVALENCE (X(57),CWHCIR),(X(58),CWHCFI),(X(59),CWCO)            E20
      EQUIVALENCE (X(60),CWCO2),(X(61),CWNOX)                           E21
      EQUIVALENCE (X(62),DEHLO)                                         E22
      EQUIVALENCE (X(63),DEOLEF),(X(64),DEAROM),(X(65),DEHLOA)          E23
      EQUIVALENCE (X(66),UEOLEF),(X(67),UEAROM),(X(68),UEHLOA)          E24
      EQUIVALENCE (X(69),CEOLEF),(X(70),CEAROM),(X(71),CEHLOA)          E25
      EQUIVALENCE (X(72),EWOLEF),(X(73),EWAROM),(X(74),EWHLOA)          E26
      EQUIVALENCE (X(75),CWOLEF),(X(76),CWAROM),(X(77),CWHLOA)          E27
      EQUIVALENCE (X(78),AFCO2),(X(79),AFCO),(X(80),AF),(X(81),CPCAIR)  E28
      EQUIVALENCE (X(82),PCTAIR),(X(83),UMPGAL),(X(84),CMPGAL)          E29
      EQUIVALENCE (X(85),CFFOIL),(X(86),EFFOIL)                         E30
      EQUIVALENCE (KD(1),MODE),(KD(2),MAGRAD),(KD(3),NOSUMM)            E31
      EQUIVALENCE (KD(4),NOREFU),(KD(5),ICHECK),(KD(6),KD6)             E32
      EQUIVALENCE (KD(7),KD7),(KD(8),KD8),(KD(9),IDIAGN)                E33
      EQUIVALENCE (KD(10),IPAUSE), (KSW(1),IBACK),(KSW(2),IOUT)         E34
      CALL REREAD
C
C
C     NOW TEST THAT DATA LIE IN A REASONABLE RANGE
```

```
C        XLOW  OR XLOW  MEANS SMALLEST VALUE CONSIDERED TO BE A VALID INPUT
C        XHIGH OR KHIGH  MEANS LARGEST VALUE CONSIDERED TO BE A VALID INPUT
C        THESE WERE PRELOADED
C
C        KSW(3) = 0   NORMAL PROCESSING EXIT
C        KSW(3) = 1   RUN ABORTED ... BACK TO INPUT DATA FOR NEW RUN
C
C        TEST CODES
C
   50 KNG = 0
   60 DO 66 I=1,7
         IF (K(I)-KLOW(I))  64,66,62
   62 IF (K(I)-KHIGH(I)) 66,66,64
C
   64 WRITE (IMESS,964)
     1                I,K(I),KLOW(I),KHIGH(I),KA
  964 FORMAT(13H K(,I1, 3H) =,I3,12H NOT BETWEEN,I3,4H AND,I3,
     1          7H ON SET, I6,I5,1H0)
C
      KNG = 1
   66 CONTINUE
C
C        TEST ALL DATA FOR MAGNITUDE
C
C        THE FOLLOWING ARE CONSIDERED ESSENTIAL VALUES AND MUST BE IN RANGE
C
C           KRUN       SERIAL RUN NUMBER
C           KLNO       SAMPLER NUMBER
C           ELMILE     MEASURED ELAPSED MILES
C           ODOM       ODOMETER READING,  MILES
C           ELMIN      ELAPSED TIME IN MINUTES
C           DELP1      DELTA P...INCHES WATER...1
C           DELP2      DELTA P...INCHES WATER...2
C           DELP3      DELTA P...INCHES WATER...3
C           CPM1       INTEGRATOR CALIBRATIONS
C           CPM2         COUNTS
C           CPM3            PER MINUTE
C           CTN        COUNTS      NITROGEN
C           CTS        COUNTS      SAMPLER
C           CTC        COUNTS      CARBURETOR
C           GTDFN      GAS TEMP,  NITROGEN
C           GTDFS      GAS TEMP,  SAMPLER
C           GTDFC      GAS TEMP,  CARBURETOR
C           DEHCIR     DILUTE EXHAUST BAG DATA...HC-IR
C           DEHCFI     DILUTE EXHAUST BAG DATA...HC-FID
C           DECO       DILUTE EXHAUST BAG DATA...CO
C           DECO2      DILUTE EXHAUST BAG DATA...CO2
C           PAMB       AMBIENT AIR PRESSURE
C
  700 DO 705 I=1,34,11
      DO 704 J=1,4
      JJJ = I + J
      IF(JJJ-3) 701,704,701
  701 IF(X(JJJ)-XLOW(JJJ)) 703,704,702
  702 IF(X(JJJ)-XHIGH(JJJ)) 704,704,703
  703 WRITE (IMESS,9703) RUN,KNAME(JJJ),JJJ,X(JJJ)
 9703 FORMAT (' RUN  ',A5,4X,A8,2X,'X(',I2,') =',F11.4)
```

```
      KNG = 1
  704 CONTINUE
C
      DO 709 I=18,21
      IF(X(I) - XLOW(I)) 708,709,707
  707 IF(X(I) - XHIGH(I)) 709,709,708
  708 WRITE (IMESS,9703) RUN,XNAME(I),I,X(I)
      KNG = 1
  709 CONTINUE
C
      IF(X(6) - XLOW(6)) 706,710,705
  705 IF(X(6)-XHIGH(6)) 710,710,706
  706 KNG = 1
      I = 6
      WRITE (IMESS,9703) RUN,XNAME(6),I,X(6)
C
C     CHECA SAMPLER NUMBER
C
  710 JJ = X(2)
      IF(JJ - K(5)) 712,714,712
  712 WRITE (IMESS,9712) RUN,JJ,K(5)
 9712 FORMAT(' RUN  ',A5,2X,
     1        22HBAD SAMPLER NO. X(2) =,I3,7H K(5) =,I3)
      KNG = 1
C
C     CHECK RUN NUMBER
C
  714 IF (RUN - BLANKS) 810,716,810
  716 WRITE (IMESS,9716)
 9716 FORMAT (' NO RUN NO.')
      KNG = 1
C
C     CHECK AMBIENT BAROMETRIC PRESSURE
C
  810 IF(PAMB - 21.0)  814,70,812
  812 IF(PAMB - 32.0)   70,70,814
  814 WRITE (IMESS,9814) RUN,PAMB
 9814 FORMAT (' RUN  ',A5,
     1        24H WEATHER BUR. BAR. PR. =,F6.2,15H OUT OF RANGE)
      KNG = 1
C
C
C
C     TEST FOR MAGNITUDE..MAKE KBAD=1 IF ANY VALUE IS NG
C
C
   70 KBAD = 0
      DO 82 I=2,48
   76 IF(X(I)-XLOW(I)) 80,82,78
   78 IF(X(I)-XHIGH(I)) 82,82,80
C
   80 WRITE (IMESS,980)
     1                 RUN,XNAME(I),I,X(I),XLOW(I),XHIGH(I)
  980 FORMAT (' RUN  ',A5,4X,A8,'  X(',I2,') =',
     1                   F11.4,4H NOT,F11.4,3H TO,F11.4)
      KBAD = 1
C
```

```
   82 CONTINUE
C
C     CHECK THAT SUBTRACTOR COL. VALUES ARE
C     LESS THAN TOTAL HYDROCARBONS
C
      IF(KSBCSW) 85,85,830
  830 IF(DEHLO - DEHCFI) 831,832,832
  831 IF(DEHLOA - DEHLO) 85,833,833
C
C     BAD SUBTRALTOR COL. VALUES
C
  832 WRITE (IMESS,8832) RUN,DEHLO,DEHCFI
 8832 FORMAT(' RUN  ',A5,26H HYDROCARBONS LESS OLEFINS,F6.0,
    1       17H EXCEEDS TOTAL HC,F6.0)
      KBAD = 1
      GO TO 85
  833 WRITE (IMESS,8833) RUN,DEHLOA,DEHLO
 8833 FORMAT(' RUN  ',A5,24H HC LESS OLEF. AND AROM.,F6.0,
    1       22H EXCEEDS HC LESS OLEF.,F6.0)
  884 KBAD = 1
   85 IF (KNG) 887,887,26
   26 IBACK = 1
      RETURN
  887 IF(KBAD) 86,89,86
   86 IF (MAGBAD) 26,26,88
C
C     MAGBAD = 1 GO AHEAD EVEN IF A MAGNITUDE IS BAD
C     MAGBAD = 0 ABORT RUN
C
   88 WRITE (IPR,988) RUN
      WRITE (ITY,988) RUN
  988 FORMAT (////'1',10('*'),' RUN ',A5,' HAS AT LEAST ONE BAD',
    1          ' MAGNITUDE ', 10('*')////)
C
   89 IF (MODE)  90,90,885
C
C     MODE = 1  FOR EDIT MODE ... NO CALCN. OR OUTPUT
C
  885 IF (IPAUSE) 90,90,886
  886 PAUSE 886
C                    IPAUSE = 1 FOR PAUSE AFTER EACH DECK IS EDITED
   90 RETURN
      END
/*
```

```
// EXEC FORTRAN
      SUBROUTINE   TCALC
C                                                                       T1
C     TRAILER  ... PROJECT 90261                                        T2
C                                                                       T3
      DOUBLE PRECISION CMAKE(10),CITY(10),RUN,BLANK8                    DP1
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                  DP2
      DIMENSION X(150),XLOW(50),XHIGH(50),HOLL(10,18)                   D1
      DIMENSION C(5),CAL(10),Y(180)                                     D2
      DIMENSION K(10),KLOW(10),KHIGH(10),KD(10),KSW(10)                 D3
      DIMENSION LIST(52),IDATA(52)                                      D4
      COMMON BLANK8,RUN,A1,A3,CMAKE,CITY,XNAME,CARLIC                   C1
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALFS,ALFONE,ALF1            C2
      COMMON ICD,IPU,IPR,ITY,K,KLOW,KHIGH,KD,LIST,IDATA,KSW             C3
      COMMON I,J,JJ,JJJ,KA,NCOMM,KSACSW,MX                              C4
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,M,KOPIES   C5
C                                                                       T
      EQUIVALENCE (Y(1),XHIGH(51))                                      E0A
      EQUIVALENCE (X(3),CFPCT),(X(5),ELMILE)                            E1
      EQUIVALENCE (X(6),ELMIN),(X(4),ODOM)                              E2
      EQUIVALENCE (X(7),CRPM)                                           E3
      EQUIVALENCE (X(8),OILRAT),(X(9),CAF),(X(11),SCFAIR),(X(12),SCFEXH)  E4
      EQUIVALENCE (X(18),DEHCIR),(X(19),DEHCFI),(X(20),DECO)            E5
      EQUIVALENCE (X(21),DECO2), (X(22),DENOX), (X(23),DEO2)            E6
      EQUIVALENCE (X(13),DELP1),(X(24),DELP2),(X(35),DELP3)             E7
      EQUIVALENCE (X(14),CPM1),(X(25),CPM2),(X(36),CPM3)                E8
      EQUIVALENCE (X(15),CTN), (X(26),CTS), (X(37),CTC)                 E9
      EQUIVALENCE (X(16),GTOFN),(X(27),GTOFS),(X(38),GTOFC)             E10
      EQUIVALENCE (X(17),GTCFN),(X(28),GTCFS),(X(39),GTCFC)             E11
      EQUIVALENCE (X(29),UEHCIR),(X(30),UEHCFI),(X(31),UECO)            E12
      EQUIVALENCE (X(32),UECO2),(X(33),UENOX),(X(34),UEO2)              E13
      EQUIVALENCE (X(40),EWHCIR),(X(41),EWHCFI),(X(42),EWCO)            E14
      EQUIVALENCE (X(43),EWCO2),(X(44),EWNOX),(X(10),EARAT)             E15
      EQUIVALENCE (X(45),RATIO)                                         E16
      EQUIVALENCE (X(46),TAMB),(X(47),PAMB),(X(48),HUMID)               E17
      EQUIVALENCE (X(49),CEARAT),(X(56),CPM)                            E17A
      EQUIVALENCE (X(50),CSCFEX),(X(51),CEHCIR),(X(52),CEHCFI)          E18
      EQUIVALENCE (X(53),CECO),(X(54),CECO2),(X(55),CENOX)              E19
      EQUIVALENCE (X(57),CWHCIR),(X(58),CWHCFI),(X(59),CWCO)            E20
      EQUIVALENCE (X(60),CWCO2),(X(61),CWNOX)                           E21
      EQUIVALENCE (X(62),DEHLO)                                         E22
      EQUIVALENCE (X(63),DEOLEF),(X(64),DEAROM),(X(65),DEHLOA)          E23
      EQUIVALENCE (X(66),UEOLEF),(X(67),UEAROM),(X(68),UEHLOA)          E24
      EQUIVALENCE (X(69),CEOLEF),(X(70),CEAROM),(X(71),CEHLOA)          E25
      EQUIVALENCE (X(72),EWOLEF),(X(73),EWAROM),(X(74),EWHLOA)          E26
      EQUIVALENCE (X(75),CWOLEF),(X(76),CWAROM),(X(77),CWHLOA)          E27
      EQUIVALENCE (X(78),AFCO2),(X(79),AFCO),(X(80),AF),(X(81),CPCAIR)  E28
      EQUIVALENCE (X(82),PCTAIR),(X(83),UMPGAL),(X(84),CMPGAL)          E29
      EQUIVALENCE (X(85),CFFOIL),(X(86),EFFOIL)                         E30
      EQUIVALENCE (KD(1),MODE),(KD(2),MAGRAD),(KD(3),NOSUMX)            E31
      EQUIVALENCE (KD(4),NOREFU),(KD(5),ICHECK),(KD(6),KD6)             E32
      EQUIVALENCE (KD(7),KD7),(KD(8),KD8),(KD(9),IDIAGN)                E33
      EQUIVALENCE (KD(10),IPAUSE), (KSW(1),IBACK),(KSW(2),IOUT)         E34
      CALL REREAD
C
C
C
```

```
C
C     NO VALUES BAD OR SOME MAGNITUDE BAD BUT MAGBAD = 1
C      ALL CALCULATED VALUES ARE REPLACED BY RECALCULATIONS
C
C
C     DEVICE CODES...MB
C     MB = 1      NO DEVICE
C     MB = 2      C.A.P.
C     MB = 3      A.I.R.
C     MB = 4      CL UP    A.I.R. + CAT. MUFFLER
C     MB = 5      ER 1
C     MB = 6      ER 2
C
   90 IF(K(13) - 2) 91,92,492
  492 MB = K(13) + 1
      GO TO 95
   92 IF(K(14) - 2) 94,94,490
  490 IF(K(14) - 4) 93,94,94
   93 MB = 2
      GO TO 95
   94 MB = 3
      GO TO 95
   91 MB = 1
   95 CFFOIL = 0.0
C
C     LEAST-SQUARES AVERAGING OF INTEGRATOR CALIBRATION
C     DOES NOT REQUIRE THAT DELP1,DELP2,DELP3 BE IN 1/2/4 RATIO
C
  100 CPM =    0.4*(DELP1*CPM1+DELP2*CPM2+DELP3*CPM3)
     1               /(DELP1**2+DELP2**2+DELP3**2)
C
C     CAL(I) IS FLOW,CFM, OF LAMINAR ELEMENT(I) AT 0.4 IN. DELTA P
C     SAMPLER MUST HAVE SAME I AS ELEMENT
C     CAL(I) PRELOADED
C
  102 JJJ = K(5)
      CFPCT = CAL(JJJ)/CPM
C
C     AVERAGE MILES PER HOUR
C
      CMPH = 60.0*ELMILE/ELMIN
C
C     CORRECTION TERM = (520/(TEMP+460))**1.8
C
  140 DO 144 I=16,38,11
  144 R(I+1) = (520.0/(R(I)+460.0))**1.80
C
C     PRESSURE CORRECTION TO DRY GAS AT 1 ATM
C
      PWAT = 10.0**(6.767183 - 3213.066  /(TAMB + 395.8))
      PCORR = (PAMB - 0.01*HUMID*PWAT)/29.92126
C
C     COUNTS CORRECTED FOR TEMPERATURE AND PRESSURE
C
      CCTN = CTN*STCPN*PCORR
      CCTS = CTS*STCPS*PCORR
      CCTC = CTC*STCPC*PCORR
```

[illegible]

```
C
C     CHECK ON SAMPLER TO CARBURETOR COUNT RATIO
C
  150 RATIO = CTS/CTC
C
C     CALCULATE AIR VOLUME      SCF PER MILE
C
  160 SCFAIR = CCTC*CFPCT/ELMILE
C
C     CALCULATE DILUTION RATIO FROM NITROGEN AND SAMPLER COUNTS
C
  200 DILRAT = 1.0 + CCTN/CCTS
C     IF NO SUBTRACTIVE COL. DATA SET
C     OLEFINS AND AROMATICS TO ZERO
      IF(ASBCSW) 201,201,202
  201 DEOLEF = 0.
      DEAROM = 0.
      DEHLO4 = 0.
      GO TO 220
C
C     CALCULATE AMT OF OLEFINS AND AROMATICS
C     BY SUBTRACTING SUBTRACTOR COLUMN DATA
C     FROM TOTAL HYDROCARBONS HCFI
C
  202 DEOLEF = DEHCFI - DEHLO
      DEAROM = DEHLO - DEHLO4
C
C
C     SCALE UP DILUTE-EXHAUST DATA BY DILUTION RATIO TO GET
C        ...N2 SCALED... UNDILUTED-EXHAUST VALUES
C
  220 DO 226 I=10,75
  226 X(I+11)= DILRAT*X(I)
      DO 227 I=63,65
  227 X(I+3) = DILRAT*X(I)
C
C     CALCULATE A/F RATIO FROM CO/CO2 RATIO
C      USING D ALLEVA AND LOVELL AND RECENT MKS EXPTL. DATA
C     NEW GWT EQUATIONS...MARCH 1, 1966
C
C     CO DECREASES TO ZERO AT A/F = 16.0
C     CO2 CURVES ROUNDED WITH MAX. AT 13.48 PER CENT CO2, A/F = 14.13
C
C     RICH MEANS CO ABOVE 1.22 PER CENT..A/F = 14.13
C        CO/CO2 RATIO ABOVE 0.09053
C
C     STEADY-STATE-EQUILIBRIUM CO AND CO2 FROM BAG CO/BAG CO2
C     THAT IS...CECO AND CECO2 FROM R = DECO/DECO2
C
  360 R = DECO/DECO2
  380 IF(R - 0.19711) 382,381,381
  381 CECO2  = 22.875/(1.5625 + R)
      AFCO2 = 5.25 + 0.625*CECO2
      GO TO 392
  382 IF(R - 0.1669) 386,383,383
  383 W = 1.9105 + 6.9*R
      CECO2  = (W - SQRT (W*W - 51.72305*R))/R
      GO TO 391
  384 IF(R - 0.09053) 386,385,385
  385 W = 3.089277  + 7.351316*R
      CECO2  = (W - SQRT (W*W - 84.77871 *R))/R
  391 AFCO2 = 12.8716 + 0.4027/(13.8 - UECO2)
      GO TO 392
  386 IF(R - 0.05456) 388,387,387
  387 W = 0.2099129  + 6.796707 *R
      CECO2  = (W + SQRT (W*W - 5.689810 *R))/R
      AFCO2 = 15.9817 - 0.30485/(13.69 - UECO2)
      GO TO 392
  388 IF(R) 389,389,390
  389 CECO2  = 11.700
      CECO = 0.0
      AFCO = 18.0
      AFCO2 = 18.0
      CAF = 18.0
      GO TO 281
  390 W = -0.26875 + 7.243635*R
      CECO2  = (W + SQRT (W*W + 6.288758 *R))/R
      AFCO2 = 41.4 - 2.0*UECO2
C
C
C     CAF = A/F RATIO FROM CECO
C     AFCO AND AFCO2 FROM N2 SCALED DATA
C
  392 CECO = R*CECO2
      IF(CECO - 2.2) 393,394,394
  393 CAF = 12.42546 + 2.9963/(CECO + 0.5375)
      AFCO = 12.42546 + 2.9963/(UECO + 0.5375)
      GO TO 281
  394 CAF = 14.4 - 0.4*CECO
      AFCO = 14.4 - 0.4*UECO
C
C     CALCULATE EXHAUST/AIR MOLE RATIO
C      GWT EQUATIONS FROM PHS MANUSCRIPT CURVE
C             SIMILAR TO FIG. 6 OF SMITH, ROSE, AND KRUSE PAPER
C
  281 AF = 0.5*(AFCO + AFCO2)
 1281 IF(CAF - 14.6) 282,282,284
  282 CEARAT = 2.51068 - CAF*(0.28372 - CAF*(0.01781 - 0.000396*CAF))
      GO TO 580
  284 CEARAT = 1.02010 - CAF*(0.013311 - 0.000500*CAF)
C
C                               X(87) AND X(88) FOR A/F CORRELATIONS
  580 X(87) = 0.0
C                               A/F DIFFERENCE BELOW 14.13
      X(88) = 0.0
C                               A/F DIFFERENCE ABOVE 14.13
      R = CAF - 14.13
      IF (R) 582,286,584
  582 X(87) = R
      GO TO 286
  584 X(88) = R
C
C
C     CALCULATE EXHAUST VOLUME   SCF PER MILE
```

```
C
  286 CSCFEX = SCFAIR*CEARAT
C
C     EFFDIL...DILUTION RATIO FROM CO/CO2 CALCN.
C        USED AS SCALING-FACTOR TO GET ..CO/CO2 SCALED.. DATA
C        PROVIDED THAT IT IS NOT SMALLER THAN DILRAT
C           CFFDIL IS SAVE STORAGE FOR ORIGINAL EFFDIL
C
      EFFDIL = ECCO2/DECO2
      CFFDIL = EFFDIL
C
C     IF EFFDIL IS LESS THAN DILRAT, MAKE EFFDIL = DILRAT
C
      IF(EFFDIL - DILRAT) 287,395,395
  287 EFFDIL = DILRAT
C
C     PCT AIR FROM EFFDIL AND CPCAIR FROM CFFDIL
C        ARE ARBITRARY MEASURES OF AIR ADDED, AIR LEAKAGE,
C        AND DEVIATION OF THE A/F CORRELATIONS ... ALL MIXED TOGETHER
C
  395 PCTAIR = 100.0*(EFFDIL - DILRAT)/(EFFDIL - DILRAT + 1.0)
      CPCAIR = 100.0*(CFFDIL - DILRAT)/(CFFDIL - DILRAT + 1.0)
C
C     ..CO/CO2 SCALED.. UNDILUTED-EXHAUST-CONCENTRATIONS
C        FROM A SCALE-UP OF DILUTE-EXHAUST DATA BY EFFDIL
C
      DO 396 I = 18,22
  396 X(I+33) = EFFDIL*X(I)
      DO 397 I=63,65
  397 X(I+6) = EFFDIL*X(I)
C
C     UNDILUTED EXHAUST...LB/MILE
C
  400 DO 402 I=1,5
      X(I+39) = C(I)*CSCFEX*X(I+28)
  402 X(I+56) = C(I)*CSCFEX*X(I+50)
      B = C(2)*CSCFEX
      DO 403 I=66,71
  403 X(I+6) = B*X(I)
C
C
C     CALCULATE MILES PER GAL.  61.0 API GRAVITY
C     FUEL TAKEN HERE TO BE CH2     MW = 14.027 PER ATOM C
C     HYDROCARBON EFFLUENT          MW = 13.857 PER ATOM C
C
  332 UMPGAL = 6.119/(1.01227*EWHCF) + 0.31872*EWCO2 + 0.50077*EWCO)
      CMPGAL = 6.119/(1.01227*CWHCF) + 0.31872*CWCO2 + 0.50L77*CWCO)
C
C     FORMAL EQUALITY OF EMISSION WEIGHTS AND MILES PER GAL.
C        FOR THE A.I.R. SYSTEM EQUIPPED CARS
C              I.E. MAKE ALL CW... EQUAL TO EW...
C
  440 IF(MX - 2) 417,417,441
  441 IF(MX - 4) 442,442,417
  442 DO 444 I=40,44
  444 X(I+17) = X(I)
      DO 446 I=72,74
  446 X(I+3) = X(I)
      CMPGAL = UMPGAL
C
C
C     FOR INTEGRAL OUTPUT OF VARIABLES IN LIST
C
  417 DO 422 I=1,52
      JJJ = LIST(I)
      IF (JJJ) 422,422,421
  421 IDATA(I) = X(JJJ) + 0.5
  422 CONTINUE
C
      IF (TAMB) 436,1092,1092
  436 IDATA(15) = TAMB - 0.1
C
 1092 RETURN
      END
/*
```

```
// EXEC FORTRAN
      SUBROUTINE TSTORE
C                                                                       T1
C     TRAILER  ... PROJECT 90261                                        T2
C                                                                       T3
      DOUBLE PRECISION CMAKE(10),CITY(10),RUN,BLANK8                    DP1
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                  DP2
      DIMENSION X(150),XLOW(50),XHIGH(50),HOLL(10,18)                   D1
      DIMENSION C(5),CAL(10),Y(100)                                     D2
      DIMENSION K(10),KLOW(10),KHIGH(10),KD(10),KSW(10)                 D3
      DIMENSION LIST(52),IDATA(52)                                      D4
      COMMON BLANK8,RUN,A1,A3,CMAKE,CITY,XNAME,CARLIC                   C1
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALFX,ALFONE,ALF3            C2
      COMMON ICD,IPU,IPR,ITY,K,KLOW,KHIGH,KD,LIST,IDATA,KSW             C3
      COMMON I,J,JJ,JJJ,KA,NCOMM,KSBCSW,MX                              C4
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,M,KOPIES   C5
C                                                                       V
      CALL REREAD
      WRITE(14'IDICT) IDISK,RUN,CARLIC, (K(I), I=1,7)
      WRITE(13'IDISK) (X(I),I=1,150),(IDATA(I), I=1,52)
C
   30 NRUNS = NRUNS + 1
C                               RUN COUNTER
      RETURN
      END
/*
```

```
// EXEC FORTRAN
      SUBROUTINE   TSUMM1
C                                                                       T1
C     TRAILER  ... PROJECT 9026.                                        T2
C                                                                       T3
      DOUBLE PRECISION CMAKE(10),CITY(10),RUN,BLANK8                    DP1
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                  DP2
      DIMENSION X(150),XLOW(50),XHIGH(50),HOLL(10,18)                   D1
      DIMENSION C(5),CAL(10),Y(100)                                     D2
      DIMENSION K(10),KLOW(10),KHIGH(10),KD(10),KSW(10)                 D3
      DIMENSION LIST(52),IDATA(52)                                      D4
      COMMON BLANK8,RUN,A1,A3,CMAKE,CITY,XNAME,CARLIC                   C1
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALFX,ALFONE,ALF3            C2
      COMMON ICD,IPU,IPR,ITY,K,KLOW,KHIGH,KD,LIST,IDATA,KSW             C3
      COMMON I,J,JJ,JJJ,KA,NCOMM,KSBCSW,MX                              C4
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,M,KOPIES   C5
C                                                                       V
      EQUIVALENCE (Y(1),XHIGH(51))                                      EQA
      EQUIVALENCE (X(3),CFPCT),(X(5),ELMILE)                            E1
      EQUIVALENCE (X(6),ELMIN),(X(4),ODOM)                              E2
      EQUIVALENCE (X(7),CMPH)                                           E3
      EQUIVALENCE (X(8),DILRAT),(X(9),CAF),(X(11),SCFAIR),(X(12),SCFEXH) E4
      EQUIVALENCE (X(18),DEHCIR),(X(19),DEHCFI),(X(20),DECO)            E5
      EQUIVALENCE (X(21),DECO2), (X(22),DENOX), (X(23),DEO2)            E6
      EQUIVALENCE (X(13),DELP1),(X(24),DELP2),(X(35),DELP3)             E7
      EQUIVALENCE (X(14),CPM1),(X(25),CPM2),(X(36),CPM3)                E8
      EQUIVALENCE (X(15),CTN), (X(26),CTS), (X(37),CTC)                 E9
      EQUIVALENCE (X(16),GTOFN),(X(27),GTOFS),(X(38),GTOFC)             E10
      EQUIVALENCE (X(17),GTCFN),(X(28),GTCFS),(X(39),GTCFC)             E11
      EQUIVALENCE (X(29),UEHCIR),(X(30),UEHCFI),(X(31),UECO)            E12
      EQUIVALENCE (X(32),UECO2),(X(33),UENOX),(X(34),UEO2)              E13
      EQUIVALENCE (X(40),EWHCIR),(X(41),EWHCFI),(X(42),EWCO)            E14
      EQUIVALENCE (X(43),EWCO2),(X(44),EWNOX),(X(10),EARAT)             E15
      EQUIVALENCE (X(45),RATIO)                                         E16
      EQUIVALENCE (X(46),TAMB),(X(47),PAMB),(X(48),HUMID)               E17
      EQUIVALENCE (X(49),CEARAT),(X(56),CPO)                            E17A
      EQUIVALENCE (X(50),CSCFEX),(X(51),CEHCIR),(X(52),CEHCFI)          E18
      EQUIVALENCE (X(53),CECO),(X(54),CECO2),(X(55),CENOX)              E19
      EQUIVALENCE (X(57),CWHCIR),(X(58),CWHCFI),(X(59),CWCO)            E20
      EQUIVALENCE (X(60),CWCO2),(X(61),CWNOX)                           E21
      EQUIVALENCE (X(62),DEHLO)                                         E22
      EQUIVALENCE (X(63),DEOLEF),(X(64),DEAROM),(X(65),DEHLOA)          E23
      EQUIVALENCE (X(66),UEOLEF),(X(67),UEAROM),(X(68),UEHLOA)          E24
      EQUIVALENCE (X(69),CEOLEF),(X(70),CEAROM),(X(71),CEHLOA)          E25
      EQUIVALENCE (X(72),EWOLEF),(X(73),EWAROM),(X(74),EWHLOA)          E26
      EQUIVALENCE (X(75),CWOLEF),(X(76),CWAROM),(X(77),CWHLOA)          E27
      EQUIVALENCE (X(78),AFCO2),(X(79),AFCO),(X(80),AF),(X(81),CPCAIR)  E28
      EQUIVALENCE (X(82),PCTAIR),(X(83),UMPGAL),(X(84),CMPGAL)          E29
      EQUIVALENCE (X(85),CFFOIL),(X(86),EFFOIL)                         E30
      EQUIVALENCE (KD(1),MODE),(KD(2),MAGRAD),(KD(3),NOSUMM)            E31
      EQUIVALENCE (KD(4),NOREFU),(KD(5),ICHECK),(KD(6),KD6)             E32
      EQUIVALENCE (KD(7),KD7),(KD(8),KD8),(KD(9),IDIAGN)                E33
      EQUIVALENCE (KD(10),IPAUSE), (KSW(1),IBACK),(KSW(2),IOUT)         E34
C
C     SKIP PRINT OF SUMMARY IF KD(3) = 1     ...  SEE MAINLINE
C
C
C
C     RUN SUMMARY OUTPUT
C
C
 9991 FORMAT(1H1)
 6000 IF(K(1) - 9) 6001,6002,6002
 6002 WRITE(12'M,8600)
 8600 FORMAT(1H1,14X,39HETHYL CORPORATION RESEARCH LABORATORIES)
      WRITE(12'M,8601)
 8601 FORMAT(22X,25HEXHAUST EMISSION RESEARCH/)
      GO TO 6003
 6001 WRITE(12'M,9600)
 9600 FORMAT(1H1,23X,'PUBLIC HEALTH SERVICE')
      WRITE(12'M,9601)
 9601 FORMAT(16X,38HEXHAUST EMISSION SURVEILLANCE CONTRACT/)
 6003 WRITE(12'M,9602) RUN,IDATA(2)
 9602 FORMAT(16H SUMMARY FOR RUN, 2X,A5,25X,8HODOMETER,I14)
      WRITE(12'M,9603) ELMILE
 9603 FORMAT (35X,9HGAS TEMP.,4X,11HOBS.  MILES,F11.3)
      JJJ = K(1)
      WRITE(12'M,9604) CITY(JJJ),ELMIN
 9604 FORMAT(5H CITY,9X,A8,13X,10(1H.),16H   OBS.  MINUTES,F9.2)
      WRITE(12'M,9605)K(2),CMPH
 9605 FORMAT(6H VISIT,I9,13X,54HCOUNT  DEG. CORR.   CALC. MILES/HR,
     1          F8.2)
      WRITE(12'M,9606) AS(MX),RATIO
 9606 FORMAT(7H DEVICE,7X, A6,26X,11HCOUNT RATIO,F11.3)
      JJJ = K(5)
      WRITE(12'M,9607) CMAKE(JJJ),IDATA(4),GTOFN,GTCFN,CPM
 9607 FORMAT(9H CAR MAKE,5X,A5,5X,6HNITR,I6,F5.0,F6.3,4X,
     1          15HAVE. COUNTS/MIN,F11.1)
      WRITE(12'M,9608) K(5),IDATA(9),GTOFS,GTCFS,CFPCT
 9608 FORMAT(11H FLOW ELEM.,I5,8X,5HSAMP,I6,F5.0,F6.3,4X,
     1          14HCUB. FT./COUNT,F8.3)
      WRITE(12'M,9610) K(6),IDATA(14),GTOFC,GTCFC,SCFAIR
 9610 FORMAT(11H CAR NUMBER,I5,6X,6HCARB,I6,F5.0,F6.3,4X,
     1          12HSCF AIR/MILE,F10.1/)
      JJJ = K(7)
      WRITE(12'M,9612) A(JJJ),CARLIC
 9612 FORMAT(1X, A6,16H RUN ON THIS CAR,T49,'LICENSE NO.',T64,A7/)
  613 WRITE(12'M,9613)
 9613 FORMAT(22X,20HFROM NITROGEN COUNTS,6X,
     1          18HFROM CO/CO2 CALCN./)
 1616 WRITE(12'M,8617)  AF
 8617 FORMAT(19H AMBIENT CONDITIONS,30X,
     1                 14HAIR/FUEL RATIO,F7.2)
  618 WRITE(12'M,9618) DILRAT,EFFDIL
 9618 FORMAT(18X,2(5X,14HDILUTION RATIO,F7.3))
 1619 WRITE(12'M,8619) IDATA(15),CEARAT
 8619 FORMAT(6H TEMP.,4X,  I5,2H F,32X,
     1                 14HEXH/AIR  RATIO,F7.3)
      WRITE(12'M,8620) PAMB,CSCFEX
 8620 FORMAT(9H PRESSURE,F6.2,4H IN.,30X,
     1                 12HSCF EXH/MILE,F9.1)
      IF(MX - 2) 621,621,612
  612 IF(MX - 4) 1621,1621,621
 1621 WRITE(12'M,8621) IDATA(16),UMPGAL
 8621 FORMAT(9H HUMIDITY,I6,4H PCT,30X,
     1                 12HMILES/GALLON,F9.1//)
      RETURN
  621 WRITE(12'M,9621) IDATA(16),UMPGAL,CMPGAL
 9621 FORMAT(9H HUMIDITY,I6,4H PCT,
     1                 2(4X,12HMILES/GALLON,F9.1,1X)//)
      RETURN
      END
/*
```

```
// EXEC FORTRAN
      SUBROUTINE   TSUMM2
C                                                                      T1
C     TRAILER  ... PROJECT 90261                                       T2
C                                                                      T3
      DOUBLE PRECISION CMAKE(10),CITY(10),RUN,BLANK8                   DP1
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                 DP2
      DIMENSION X(150),XLOW(150),XHIGH(150),HOLL(10,18)                D1
      DIMENSION C(5),CAL(10),Y(180)                                    D2
      DIMENSION K(10),KLOW(10),KHIGH(10),KD(10),KSW(10)                D3
      DIMENSION LIST(52),IDATA(52)                                     D4
      COMMON BLANK8,RUN,A1,A3,CMAKE,CITY,XNAME,CARLIC                  C1
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALFX,ALFONE,ALF3           C2
      COMMON ICD,IPU,IPR,ITY,K,KLOW,KHIGH,KD,LIST,IDATA,KSW            C3
      COMMON I,J,JJ,JJJ,KA,NCOMM,KSDCSW,MX                             C4
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,M,KOPIES  C5
C                                                                      F
      EQUIVALENCE (Y(1),XHIGH(100))                                    E0A
      EQUIVALENCE (X(3),CFPCT),(X(5),ELMILE)                           E1
      EQUIVALENCE (X(2),ELMIN),(X(4),ODOM)                             E2
      EQUIVALENCE (X(7),CMPH)                                          E3
      EQUIVALENCE (X(8),DILRAT),(X(9),CAF),(X(11),SCFAIR),(X(12),SCFEXH) E4
      EQUIVALENCE (X(18),DEHCIR),(X(19),DEHCFI),(X(20),DECO)           E5
      EQUIVALENCE (X(21),DECO2), (X(22),DENOX), (X(23),DEO2)           E6
      EQUIVALENCE (X(13),DELP1),(X(24),DELP2),(X(35),DELP3)            E7
      EQUIVALENCE (X(14),CPM1),(X(25),CPM2),(X(36),CPM3)               E8
      EQUIVALENCE (X(15),CTN), (X(26),CTS), (X(37),CTC)                E9
      EQUIVALENCE (X(16),GTDFN),(X(27),GTDFS),(X(38),GTDFC)            E10
      EQUIVALENCE (X(17),GTCFN),(X(28),GTCFS),(X(39),GTCFC)            E11
      EQUIVALENCE (X(29),UEHCIR),(X(30),UEHCFI),(X(31),UECO)           E12
      EQUIVALENCE (X(32),UECO2),(X(33),UENOX),(X(34),UEO2)             E13
      EQUIVALENCE (X(40),EWHCIR),(X(41),EWHCFI),(X(42),EWCO)           E14
      EQUIVALENCE (X(43),EWCO2),(X(44),EWNOX),(X(10),EARAT)            E15
      EQUIVALENCE (X(45),RATIO)                                        E16
      EQUIVALENCE (X(46),TAMB),(X(47),PAMB),(X(48),HUMID)              E17
      EQUIVALENCE (X(49),CEARAT),(X(56),CPM)                           E17A
      EQUIVALENCE (X(50),CSLFEX),(X(51),CEHCIR),(X(52),CEHCFI)         E18
      EQUIVALENCE (X(53),CECO),(X(54),CECO2),(X(55),CENOX)             E19
      EQUIVALENCE (X(57),CWHCIR),(X(58),CWHCFI),(X(59),CWCO)           E20
      EQUIVALENCE (X(60),CWCO2),(X(61),CWNOX)                          E21
      EQUIVALENCE (X(62),DEHLO)                                        E22
      EQUIVALENCE (X(63),DEOLEF),(X(64),DEAROM),(X(65),DEHLOA)         E23
      EQUIVALENCE (X(66),UEOLEF),(X(67),UEAROM),(X(68),UEHLOA)         E24
      EQUIVALENCE (X(69),CEOLEF),(X(70),CEAROM),(X(71),CEHLOA)         E25
      EQUIVALENCE (X(72),EWOLEF),(X(73),EWAROM),(X(74),EWHLOA)         E26
      EQUIVALENCE (X(75),CWOLEF),(X(76),CWAROM),(X(77),CWHLOA)         E27
      EQUIVALENCE (X(78),AFCO2),(X(79),AFCO),(X(80),AF),(X(81),CPFAIR) E28
      EQUIVALENCE (X(82),PCTAIR),(X(83),UMPGAL),(X(84),CMPGAL)         E29
      EQUIVALENCE (X(85),CFFOIL),(X(86),EFFOIL)                        E30
      EQUIVALENCE (KD(1),MODE),(KD(2),MAGBAD),(KD(3),NOSUMM)           E31
      EQUIVALENCE (KD(4),NOREFU),(KD(5),ICHECK),(KD(6),KD6)            E32
      EQUIVALENCE (KD(7),KD7),(KD(8),KD8),(KD(9),IDIAGN)               E33
      EQUIVALENCE (KD(10),IPAUSE), (KSW(1),IBACK),(KSW(2),IOUT)        E34
 1622 WRITE(12'M,8622)
      WRITE(12'M,9622)
      WRITE(12'M,9623)
 8622 FORMAT(22X,23H....NITROGEN SCALED....)
```

```
     1            3X,23H.....CO/CO2 SCALED.....)
9622 FORMAT(19H EFFLUENT  DILUTE  ,2(26H   UNDILUTED  EMISSION WT.))
9623 FORMAT(1X,7HEXHAUST,2(26H    EXHAUST    LB/MILE  )/)
     IF(MX - 2) 625,624,1624
1624 WRITE(12'M,9624) IDATA(5),IDATA(17),EWHCIR,IDATA(10)
     WRITE(12'M,9112)
     WRITE(12'M,8881)
     WRITE(12'M,8883) IDATA(6),IDATA(18),EWHCFI,IDATA(11)
     IF (KSRCSW)1626,1626,1625
1625 WRITE(12'M,8885) IDATA(20),IDATA(23),EWOLEF,IDATA(26)
     WRITE(12'M,8887) IDATA(21),IDATA(24),EWAROM,IDATA(27)
     WRITE(12'M,8889) IDATA(22),IDATA(25),EWHLOA,IDATA(28)
1626 WRITE(12'M,9112)
     WRITE(12'M,9626) IDATA(7),IDATA(19),EWNOX,IDATA(12)
     WRITE(12'M,9112)
     WRITE(12'M,9627)DECO,UECO,EWCO,CECO
     WRITE(12'M,9628)DECO2,UECO2,EWCO2,CECO2
     GO TO 629
 624 WRITE(12'M,9624) IDATA(5),IDATA(17),EWHCIR,IDATA(10),CWHCIR
9624 FORMAT(8H HC NDIR,I6,5H PPMC,2(I8,5H PPMC,F10.4,3X))
     WRITE(12'M,9112)
     WRITE(12'M,8881)
     WRITE(12'M,8883) IDATA(6),IDATA(18),EWHCFI,IDATA(11),CWHCFI
     IF (KSRCSW) 626, 626, 625
 625 WRITE(12'M,8885) IDATA(20),IDATA(23),EWOLEF,IDATA(26),CWOLEF
     WRITE(12'M,8887) IDATA(21),IDATA(24),EWAROM,IDATA(27),CWAROM
     WRITE(12'M,8889) IDATA(22),IDATA(25),EWHLOA,IDATA(28),CWHLOA
 626 WRITE(12'M,9112)
     WRITE(12'M,9626) IDATA(7),IDATA(19),EWNOX,IDATA(12),CWNOX
9626 FORMAT(4H NOX,I10,4H PPM,2(I9,4H PPM,F11.4,2X)/)
     WRITE(12'M,9627)DECO,UECO,EWCO,CECO,CWCO
9627 FORMAT(3H CO,F11.2,4H PCT,2(F9.2,4H PCT,F11.4,2X))
     WRITE(12'M,9628)DECO2,UECO2,EWCO2,CECO2,CWCO2
9628 FORMAT(4H CO2,F10.2,4H PCT,2(F9.2,4H PCT,F11.4,2X))
C
 629 WRITE(12'M,9629)DEO2,UEO2
9629 FORMAT(3H O2,F11.2,4H PCT,F9.2,4H PCT//)
     IF (CFFDIL - DILRAT) 630,1108,1108
 630 WRITE(12'M,9630) CFFDIL,DILRAT
9630 FORMAT(32H DIL. RATIO FROM CO/CO2 CALCN. =,F6.1/
    1    5X, 16H IS LOWER THAN,F6.3,21H FROM NITROGEN COUNTS//)
8881 FORMAT(7H HC FID)
8883 FORMAT(7H TOTAL ,I7,5H PPMC,2(I8,5H PPMC,F10.4,3X))
8885 FORMAT(9H  OLEFINS,I5,5H PPMC,2(I6,5H PPMC,F10.4,3X))
8887 FORMAT(9H  AROMAT.,I5,5H PPMC,2(I8,5H PPMC,F10.4,3X))
8889 FORMAT(9H  PARAFS.,I5,5H PPMC,2(I8,5H PPMC,F10.4,3X))
9112 FORMAT(1H )
C
C     PRINT COMMENT CARDS ............DELETING THE CODES
C
1108 DO 1115 JJJ = 1,NCOMM
1115 WRITE(12'M,9001) (HOLL(JJJ,I), I=1,18)
9001 FORMAT (1X,A1,17A4,I9,I1)
     RETURN
     END
/*
```

```
// EXEC FORTRAN
      SUBROUTINE TSUMM3                                                 T1
C                                                                       T2
C     TRAILER ... PROJECT 90261                                         T3
C
      DOUBLE PRECISION CMAKE(10),CITY(10),RUN,BLANK8                    DP1
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                  DP2
      DIMENSION X(150),XLOW(50),XHIGH(50),HOLL(10,18)                   D1
      DIMENSION C(5),CAL(10),Y(180)                                     D2
      DIMENSION K(10),KLOW(10),KHIGH(10),KD(10),KSW(10)                 D3
      DIMENSION LIST(52),IDATA(52)                                      D4
      COMMON BLANK8,RUN,A1,A3,CMAKE,CITY,XNAME,CARLIC                   C1
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALFX,ALFONE,ALF3            C2
      COMMON ICD,IPU,IPR,ITY,K,KLOW,KHIGH,KD,LIST,IDATA,KSW             C3
      COMMON I,J,JJ,JJJ,KA,NCOMM,KSBCSW,MX                              C4
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,M,KOPIES   C5
C                                                                       T
      EQUIVALENCE (Y(1),XHIGH(51))                                      E0A
      EQUIVALENCE (X(3),CFPCT),(X(5),LLMILE)                            E1
      EQUIVALENCE (X(6),ELMIN),(X(4),ODOM)                              E2
      EQUIVALENCE (X(7),CMPH)                                           E3
      EQUIVALENCE (X(8),SILRAT),(X(9),CAF),(X(11),SCFAIR),(X(12),SCFEXH)  E4
      EQUIVALENCE (X(18),DEHCIR),(X(19),DEHCFI),(X(20),DECO)            E5
      EQUIVALENCE (X(21),DECO2), (X(22),DENOX), (X(23),DEO2)            E6
      EQUIVALENCE (X(13),DELP1),(X(24),DELP2),(X(35),DELP3)             E7
      EQUIVALENCE (X(14),CPM1),(X(25),CPM2),(X(36),CPM3)                E8
      EQUIVALENCE (X(15),CTN), (X(26),CTS), (X(37),CTC)                 E9
      EQUIVALENCE (X(16),GTDFN),(X(27),GTDFS),(X(38),GTDFC)             E10
      EQUIVALENCE (X(17),GTCFN),(X(28),GTCFS),(X(39),GTCFC)             E11
      EQUIVALENCE (X(29),UEHCIR),(X(30),UEHCFI),(X(31),UECO)            E12
      EQUIVALENCE (X(32),UECO2),(X(33),UENOX),(X(34),UEO2)              E13
      EQUIVALENCE (X(40),EWHCIR),(X(41),EWHCFI),(X(42),EWCO)            E14
      EQUIVALENCE (X(43),EWCO2),(X(44),EWNOX),(X(10),EARAT)             E15
      EQUIVALENCE (X(45),RATIO)                                         E16
      EQUIVALENCE (X(46),TAMB),(X(47),PAMB),(X(48),HUMID)               E17
      EQUIVALENCE (X(49),CEARAT),(X(56),CPM)                            E17A
      EQUIVALENCE (X(50),CSCFEX),(X(51),CEHCIR),(X(52),CEHCFI)          E18
      EQUIVALENCE (X(53),CECO),(X(54),CECO2),(X(55),CENOX)              E19
      EQUIVALENCE (X(57),CWHCIR),(X(58),CWHCFI),(X(59),CWCO)            E20
      EQUIVALENCE (X(60),CWCO2),(X(61),CWNOX)                           E21
      EQUIVALENCE (X(62),DEHLO)                                         E22
      EQUIVALENCE (X(63),DEOLEF),(X(64),DEAROM),(X(65),DEHLOA)          E23
      EQUIVALENCE (X(66),UEOLEF),(X(67),UEAROM),(X(68),UEHLOA)          E24
      EQUIVALENCE (X(69),CEOLEF),(X(70),CEAROM),(X(71),CEHLOA)          E25
      EQUIVALENCE (X(72),EWOLEF),(X(73),EWAROM),(X(74),EWHLOA)          E26
      EQUIVALENCE (X(75),CWOLEF),(X(76),CWAROM),(X(77),CWHLOA)          E27
      EQUIVALENCE (X(78),AFCO2),(X(79),AFCO),(X(80),AF),(X(81),CPCAIR)  E28
      EQUIVALENCE (X(82),PCTAIR),(X(83),UMPGAL),(X(84),CMPGAL)          E29
      EQUIVALENCE (X(85),CFFOIL),(X(86),EFFOIL)                         E30
      EQUIVALENCE (KD(1),MODE),(KD(2),MAGBAD),(KD(3),NOSUMM)            E31
      EQUIVALENCE (KD(4),NOREFU),(KD(5),ICHECK),(KD(6),K96)             E32
      EQUIVALENCE (KD(7),KD7),(KD(5),KD5),(KD(9),IDIAGN)                 E33
      EQUIVALENCE (KD(10),IPAUSE), (KSW(1),IBACK),(KSW(2),IOUT)          E34
C
      CALL REREAD
C
C     SKIP PRINT OF SUMMARY IF KD(3) = 1     ...  SEE MAINLINE
C
C
C
C     RUN SUMMARY OUTPUT
C
C
 9991 FORMAT(1H1)
 6000 IF(K(1) - 9) 6001,6002,6002
 6002 WRITE (IPR,8600)
 8600 FORMAT    (15X,39HETHYL CORPORATION RESEARCH LABORATORIES)
      WRITE (IPR,8601)
 8601 FORMAT(22X,25HEXHAUST EMISSION RESEARCH/)
      GO TO 6003
 6001 WRITE (IPR,9600)
 9600 FORMAT    (24X,'PUBLIC HEALTH SERVICE')
      WRITE (IPR,9601)
 9601 FORMAT(16X,38HEXHAUST EMISSION SURVEILLANCE CONTRACT/)
 6003 WRITE (IPR,9602) RUN,IDATA(2)
 9602 FORMAT(16H SUMMARY FOR RUN, 2X,A5,29X,8HODOMETER,I14)
      WRITE (IPR,9603) ELMILE
 9603 FORMAT (35X,9HGAS TEMP.,4X,11HOBS.  MILES,F11.3)
      JJJ = K(1)
      WRITE (IPR,9604) CITY(JJJ),ELMIN
 9604 FORMAT(5H CITY,9X,A8,13X,10(1H.),16H   OBS.  MINUTES,F9.2)
      WRITE (IPR,9605)K(2),CMPH
 9605 FORMAT(6H VISIT,I9,13X,34HCOUNT  DEG. CORR.   CALC. MILES/HR,
     1       F8.2)
      WRITE (IPR,9606) A3(MX),RATIO
 9606 FORMAT(7H DEVICE,7X, A6,28X,11HCOUNT RATIO,F11.3)
      JJJ = K(4)
      WRITE (IPR,9607) CMAKE(JJJ),IDATA(4),GTDFN,GTCFN,CPM
 9607 FORMAT(9H CAR MAKE,4X,A5,5X,4HNITR,I6,F5.0,F6.3,4X,
     1       15HAVE. COUNTS/MIN,F7.1)
      WRITE (IPR,9608) K(5),IDATA(9),GTDFS,GTCFS,CFPCT
 9608 FORMAT(11H FLOW ELEM.,I4,8X,4HSAMP,I6,F5.0,F6.3,4X,
     1       14HCUB. FT./COUNT,F8.3)
      WRITE (IPR,9610) K(6),IDATA(14),GTDFC,GTCFC,SCFAIR
 9610 FORMAT(11H CAR NUMBER,I4,8X,4HCARB,I6,F5.0,F6.3,4X,
     1       12HSCF AIR/MILE,F10.1/)
      JJJ = K(7)
      WRITE (IPR,9612) A1(JJJ),CARLIC
 9612 FORMAT(1X, A6,16H RUN ON THIS CAR,T49,'LICENSE NO.',T64,A7/)
  613 WRITE (IPR,9613)
 9613 FORMAT(22X,20HFROM NITROGEN COUNTS,6X,
     1       18HFROM CO/CO2 CALCN./)
 1616 WRITE (IPR,8617) CAF
 8617 FORMAT(19H AMBIENT CONDITIONS,30X,
     1             14HAIR/FUEL RATIO,F7.2)
  618 WRITE (IPR,9618) DILRAT,EFFDIL
 9618 FORMAT(18X,2(5X,14HDILUTION RATIO,F7.3))
 1619 WRITE (IPR,8619) IDATA(15),LEARAT
```

```
8619 FORMAT(16H TEMP.,6X,  I5,2H F,32X,
    1            15HEXH/AIR  RATIO,F7.1)
     WRITE (IPR,8620) PAMB,ESCFEM
8620 FORMAT(19H PRESSURE,F6.2,5H IN.,30X,
    1            12HSCF EXH/MILE,F9.1)
     IF(IRX - 2) 621,621,612
 612 IF(IRX - 5) 1621,1621,621
1621 WRITE (IPR,8621) IDATA(16),UMPGAL
8621 FORMAT(19H HUMIDITY,I6,5H PCT,30X,
    1            12HMILES/GALLON,F9.1//)
     RETURN
 621 WRITE (IPR,9621) IDATA(16),UMPGAL,EMPGAL
9621 FORMAT(19H HUMIDITY,I6,5H ' ,T,
    1            21X,12HMILES/ ALLON,F9.1,1X)//)
     RETURN
     END
/*
```

```
// EXEC FORTRAN
      SUBROUTINE TSUMMS
C                                                                         T1
C     TRAILER  ::: PROJECT 90261                                          T2
C                                                                         T3
      DOUBLE PRECISION CMAKE(10),CITY(10),RUN,BLANK8                      DP1
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                    DP2
      DIMENSION X(150),XLOW(150),XHIGH(150),HOLL(10,18)                   D1
      DIMENSION C(5),CAL(10),Y(50)                                        D2
      DIMENSION K(10),KLOW(10),KHIGH(10),KD(10),KSW(10)                   D3
      DIMENSION LIST(52),IDATA(52)                                        D4
      COMMON BLANK8,RUN,A1,A3,CMAKE,CITY,XNAME,CARLIC                     C1
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALF5,ALFONE,ALF3              C2
      COMMON ICD,IPU,IPR,ITY,K,KLOW,KHIGH,KD,LIST,IDATA,KSW               C3
      COMMON I,J,JJ,JJJ,KA,NCOMM,KSBCSW,MX                                C4
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,N,KOPIES     C5
C                                                                         V
      EQUIVALENCE (Y(1),XHIGH(100))                                       E0A
      EQUIVALENCE (X(3),CFPCT),(X(5),ELMILE)                              E1
      EQUIVALENCE (X(6),ELMIN),(X(4),ODOM)                                E2
      EQUIVALENCE (X(7),CMPH)                                             E3
      EQUIVALENCE (X(8),OILRAT),(X(9),CAF),(X(11),SCFAIR),(X(12),SCFFXH)  E4
      EQUIVALENCE (X(18),DEHCIR),(X(19),DEHCFI),(X(20),DECO)              E5
      EQUIVALENCE (X(21),DECO2), (X(22),DENOX), (X(23),DEO2)              E6
      EQUIVALENCE (X(13),DELP1),(X(24),DELP2),(X(35),DELP3)               E7
      EQUIVALENCE (X(14),CPM1),(X(25),CPM2),(X(36),CPM3)                  E8
      EQUIVALENCE (X(15),CTN), (X(26),CTS), (X(37),CTC)                   E9
      EQUIVALENCE (X(16),GTOFN),(X(27),GTOFS),(X(38),GTOFC)               E10
      EQUIVALENCE (X(17),GTCFN),(X(28),GTCFS),(X(39),GTCFC)               E11
      EQUIVALENCE (X(29),UEHCIR),(X(30),UEHCFI),(X(31),UECO)              E12
      EQUIVALENCE (X(32),UECO2),(X(33),UENOX),(X(34),UEO2)                E13
      EQUIVALENCE (X(40),EWHCIR),(X(41),EWHCFI),(X(42),EWCO)              E14
      EQUIVALENCE (X(43),EWCO2),(X(44),EWNOX),(X(10),EARAT)               E15
      EQUIVALENCE (X(45),RATIO)                                           E16
      EQUIVALENCE (X(46),TAMB),(X(47),PAMB),(X(48),HUMID)                 E17
      EQUIVALENCE (X(49),CEARAT),(X(56),CPM)                              E17A
      EQUIVALENCE (X(50),CSCFEX),(X(51),CEHCIR),(X(52),CEHCFI)            E18
      EQUIVALENCE (X(53),CECO),(X(54),CECO2),(X(55),CENOX)                E19
      EQUIVALENCE (X(57),CWHCIR),(X(58),CWHCFI),(X(59),CWCO)              E20
      EQUIVALENCE (X(60),CWCO2),(X(61),CWNOX)                             E21
      EQUIVALENCE (X(62),DEHLD)                                           E22
      EQUIVALENCE (X(63),DEOLEF),(X(64),DEAROM),(X(65),DEHLOA)            E23
      EQUIVALENCE (X(66),UEOLEF),(X(67),UEAROM),(X(68),UEHLOA)            E24
      EQUIVALENCE (X(69),CEOLEF),(X(70),CEAROM),(X(71),CEHLOA)            E25
      EQUIVALENCE (X(72),EWOLEF),(X(73),EWAROM),(X(74),EWHLOA)            E26
      EQUIVALENCE (X(75),CWOLEF),(X(76),CWAROM),(X(77),CWHLOA)            E27
      EQUIVALENCE (X(78),AFCO2),(X(79),AFCO),(X(80),AF),(X(81),CPCAIR)    E28
      EQUIVALENCE (X(82),PCTAIR),(X(83),UMPGAL),(X(84),CMPGAL)            E29
      EQUIVALENCE (X(85),CFFOIL),(X(86),EFFOIL)                           E30
      EQUIVALENCE (KD(1),MODE),(KD(2),MAGRAD),(KD(3),NOSUMM)              E31
      EQUIVALENCE (KD(4),NOREFU),(KD(5),ICHECK),(KD(6),KD6)               E32
      EQUIVALENCE (KD(7),KD7),(KD(8),KD8),(KD(9),IDIAGN)                  E33
      EQUIVALENCE (KD(10),IPAUSE), (KSW(1),IBACK),(KSW(2),IOUT)           E34
C
      CALL REREAD
 1622 WRITE (IPR,8622)
      WRITE (IPR,9622)
      WRITE (IPR,9623)
 8622 FORMAT(22X,23H....NITROGEN SCALED.....;
     1       3X,23H.....CO/CO2 SCALED.....)
 9622 FORMAT(19H EFFLUENT  DILUTE  ,2(26H   UNDILUTED  EMISSION WT.))
 9623 FORMAT(1X,7HEXHAUST,2(26H    EXHAUST     LB/MILE  )/)
      IF(IRR - 2) 624,624,1624
 1624 WRITE (IPR,9625) IDATA(5),IDATA(17),EWHCIR,IDATA(10)
      WRITE (IPR,9112)
      WRITE (IPR,8881)
      WRITE (IPR,8883) IDATA(6),IDATA(18),EWHCFI,IDATA(11)
      IF (KSBCSW)1626,1626,1625
 1625 WRITE (IPR,8885) IDATA(20),IDATA(23),EWOLEF,IDATA(26)
      WRITE (IPR,8887) IDATA(21),IDATA(24),EWAROM,IDATA(27)
      WRITE (IPR,8889) IDATA(22),IDATA(25),EWHLOA,IDATA(28)
 1626 WRITE (IPR,9112)
      WRITE (IPR,9626) IDATA(7),IDATA(19),EWNOX,IDATA(12)
      WRITE (IPR,9112)
      WRITE (IPR,9627)DECO,UECO,EWCO,CECO
      WRITE (IPR,9628)DECO2,UECO2,EWCO2,CECO2
      GO TO 629
  624 WRITE (IPR,9624) IDATA(5),IDATA(17),EWHCIR,IDATA(10),CWHCIR
 9624 FORMAT(8H HC NDIR,I6,5H PPMC,2(I8,5H PPMC,F10.4,3X))
      WRITE (IPR,9112)
      WRITE (IPR,8881)
      WRITE (IPR,8883) IDATA(6),IDATA(18),EWHCFI,IDATA(11),CWHCFI
      IF (KSBCSW) 626, 626, 625
  625 WRITE (IPR,8885) IDATA(20),IDATA(23),EWOLEF,IDATA(26),CWOLEF
      WRITE (IPR,8887) IDATA(21),IDATA(24),EWAROM,IDATA(27),CWAROM
      WRITE (IPR,8889) IDATA(22),IGATA(25),EWHLOA,IDATA(28),CWHLOA
  626 WRITE (IPR,9112)
      WRITE (IPR,9626) IDATA(7),IDATA(19),EWNOX,IDATA(12),CWNOX
 9626 FORMAT(4H NOX,I10,4H PPM,2(I9,4H PPM,F11.4,2X)/)
      WRITE (IPR,9627)DECO,UECO,EWCO,CECO,CWCO
 9627 FORMAT(3H CO,F11.2,4H PCT,2(F9.2,4H PCT,F11.4,2X))
      WRITE (IPR,9628)DECO2,UECO2,EWCO2,CECO2,CWCO2
 9628 FORMAT(4H CO2,F10.2,4H PCT,2(F9.2,4H PCT,F11.4,2X))
C
  629 WRITE (IPR,9629)DEO2,UEO2
 9629 FORMAT(3H O2,F11.2,4H PCT,F9.2,4H PCT//)
      IF (CFFOIL - DILRAT) 630,1106,1108
  630 WRITE (IPR,9630) CFFOIL,DILRAT
 9630 FORMAT(32H DIL. RATIO FROM CO/CO2 CALCN. =,F6.3/
     1    5X, 14H IS LOWER THAN,F6.3,21H FROM NITROGEN COUNTS//)
 8881 FORMAT(7H HC FID)
 8883 FORMAT(7H TOTAL ,I7,5H PPMC,2(I8,5H PPMC,F10.4,3X))
 8885 FORMAT(9H  OLEFINS,I5,5H PPMC,2(I8,5H PPMC,F10.4,3X))
 8887 FORMAT(9H  AROMAT.,I5,5H PPMC,2(I8,5H PPMC,F10.4,3X))
 8889 FORMAT(9H  PARAFS.,I5,5H PPMC,2(I8,5H PPMC,F10.4,3X))
 9112 FORMAT(1H )
C
C     PRINT COMMENT CARDS ............DELETING THE CODES
C
 1108 DO 1115 JJJ = 1,NCOMM
 1115 WRITE (IPR,9001) (HOL(JJJ,I), I=1,18)
 9001 FORMAT (1X,A1,17A4,I9,I1)
      RETURN
      END
```

```
/*
```

```
// EXEC FORTRAN
      SUBROUTINE   TREFUR
C                                                                        T1
C     TRAILER  ... PROJECT 90261                                         T2
C                                                                        T3
      DOUBLE PRECISION CMAKE(10),CITY(10),RUN,BLANK8                     DP1
      DOUBLE PRECISION XNAME(150),A1(10),A3(10),CARLIC                   DP2
      DIMENSION X(150),XLOW(50),XHIGH(50),HOLL(10,18)                    D1
      DIMENSION C(5),CAL(10),Y(180)                                      D2
      DIMENSION K(10),KLOW(10),KHIGH(10),KD(10),KSW(10)                  D3
      DIMENSION LIST(52),IDATA(52)                                       D4
      COMMON BLANK8,RUN,A1,A3,CMAKE,CITY,XNAME,CARLIC                    C1
      COMMON X,XLOW,XHIGH,HOLL,C,CAL,BLANK1,ALFX,ALFONE,ALF3             C2
      COMMON ICD,IPU,IPR,ITY,K,KLOW,KHIGH,KD,LIST,IDATA,KSW              C3
      COMMON I,J,JJ,JJJ,KA,NCORR,KSBCSW,MR                               C4
      COMMON IDISK,IDICT,KDISK,KDICT,IRUNS,JRUNS,NRUNS,IMESS,M,KOPIES    C5
C                                                                        T
      EQUIVALENCE (Y(1),XHIGH(51))                                       E0A
      EQUIVALENCE (X(3),CPPCT),(X(5),ELMILE)                             E1
      EQUIVALENCE (X(6),ELMIN),(X(4),ODOM)                               E2
      EQUIVALENCE (X(7),EMPH)                                            E3
      EQUIVALENCE (X(8),OILRAT),(X(9),CAF),(X(11),SCFAIR),(X(12),SCFEXH) E4
      EQUIVALENCE (X(18),DEHCIR),(X(19),DEHCFI),(X(20),DECO)             E5
      EQUIVALENCE (X(21),DECO2), (X(22),DENOX), (X(23),DEO2)             E6
      EQUIVALENCE (X(13),DELP1),(X(24),DELP2),(X(35),DELP3)              E7
      EQUIVALENCE (X(14),CPM1),(X(25),CPM2),(X(36),CPM3)                 E8
      EQUIVALENCE (X(15),CTN), (X(26),CTS), (X(37),CTC)                  E9
      EQUIVALENCE (X(16),GTDFN),(X(27),GTDFS),(X(38),GTDFC)              E10
      EQUIVALENCE (X(17),GTCFN),(X(28),GTCFS),(X(39),GTCFC)              E11
      EQUIVALENCE (X(29),UEHCIR),(X(30),UEHCFI),(X(31),UECO)             E12
      EQUIVALENCE (X(32),UECO2),(X(33),UENOX),(X(34),UEO2)               E13
      EQUIVALENCE (X(40),EWHCIR),(X(41),EWHCFI),(X(42),EWCO)             E14
      EQUIVALENCE (X(43),EWCO2),(X(44),EWNOX),(X(10),EARAT)              E15
      EQUIVALENCE (X(45),RATIO)                                          E16
      EQUIVALENCE (X(46),TAMB),(X(47),PAMB),(X(48),HUMID)                E17
      EQUIVALENCE (X(49),CEARAT),(X(56),CPM)                             E17A
      EQUIVALENCE (X(50),CSCFEX),(X(51),CEHCIR),(X(52),CEHCFI)           E18
      EQUIVALENCE (X(53),CECO),(X(54),CECO2),(X(55),CENOX)               E19
      EQUIVALENCE (X(57),CWHCIR),(X(58) CWHCFI).(X(59),CWCO)             E20
      EQUIVALENCE (X(60),CWCO2),(X(61),CWNOX)                            E21
      EQUIVALENCE (X(62),DEHLO)                                          E22
      EQUIVALENCE (X(63),DEOLEF),(X(64),DEAROM),(X(65),DEHLOA)           E23
      EQUIVALENCE (X(66),UEOLEF),(X(67),UEAROM),(X(68),UEHLOA)           E24
      EQUIVALENCE (X(69),CEOLEF),(X(70),CEAROM),(X(71),CEHLOA)           E25
      EQUIVALENCE (X(72),EWOLEF),(X(73),EWAROM),(X(74),EWHLOA)           E26
      EQUIVALENCE (X(75),CWOLEF),(X(76),CWAROM),(X(77),CWHLOA)           E27
      EQUIVALENCE (X(78),AFCO2),(X(79),AFCO),(X(80),AF),(X(81),CPLAIR)   E28
      EQUIVALENCE (X(82),PCTAIR),(X(83),UMPGAL),(X(84),CMPGAL)           E29
      EQUIVALENCE (X(85),CFFOIL),(X(86),EFFOIL)                          E30
      EQUIVALENCE (KD(1),MODE),(KD(2),MAGBAD),(KD(3),NOSUMM)             E31
      EQUIVALENCE (KD(4),NOREFU),(KD(5),ICHECK),(KD(6),KD6)              E32
      EQUIVALENCE (KD(7),KD7),(KD(8),KD8),(KD(9),IDIAGN)                 E33
      EQUIVALENCE (KD(10),IPAUSE), (KSW(1),IBACK),(KSW(2),IOUT)          E34
      CALL REREAD
C
C
C
C     MAKE THE REFURBISHED DATA DECK
C     USUAL   CARD 03 HAS ;;CO/CO2 SCALED;; UNDILUTED=EXHAUST-CONCN.
C     SPECIAL CARD 07 HAS ;;N2 SCALED;;      UNDILUTED=EXHAUST-CONCN.
C        THAT IS,  TAILPIPE=EXHAUST-CONCN.
C     USUAL   CARD 04 HAS ;;N2 SCALED;;      EMISSION WT.;LB/MILE
C
C     NOTE THAT THERE ARE THREE CARDS CODED 7 IN COL. 80
C        THESE HAVE 1,2,3 IN COL. 2
C
  740 WRITE (IPU,9721) RUN,IDATA(1),CFPCT,IDATA(2),ELMILE,ELMIN,EMPH,
     1      DILRAT,CAF,CEARAT,SCFAIR,CSCFCR,KA
      WRITE (IPU,9722) DELP1,IDATA(3),IDATA(4),GTDFN,GTCFN,IDATA(5),
     1      IDATA(6),DECO,DECO2,IDATA(7),DEO2,KA
      WRITE (IPU,9723) DELP2,IDATA(8),IDATA(9),CMPGAL,GTDFS,GTCFS,
     1      IDATA(10),IDATA(11),CECO,CECO2,IDATA(12),UEO2,KA
      WRITE (IPU,9724) DELP3,IDATA(13),IDATA(14),GTDFC,GTCFC,EWHLIR,
     1      EWHCFI,EWCO,EWCO2,EWNOX,RATIO,KA
 9721 FORMAT(1X,A5,I1,F7.3,I6,F7.3,F7.2,2(F6.2,F6.3),
     1      2F6.1,I9,1H1)
 9722 FORMAT(F3.1,I4,I6,F12.1,F6.3,2I6,2F7.2,I7,F6.2,I9,1H2)
 9723 FORMAT(F3.1,I4,I6,F6.1,F6.1,F6.3,2I6,2F7.2,I7,F6.2,I9,1H3)
 9727 FORMAT(2H 1,5X,F6.1,F6.1,12X,2I6,2F7.2,I7,F6.2,I9,1H7)
 9724 FORMAT(F3.1,I4,I6,F12.1,F6.3,2F6.4,F7.4,F7.3,F7.4,F6.3,I9,1H4)
  725 I = 5
      WRITE (IPU,9001) (HOLL(1,J), J=1,18),KA,I
      I = 6
      WRITE (IPU,9001) (HOLL(2,J), J=1,18),KA,I
      WRITE (IPU,9727)PCTAIR,UMPGAL,IDATA(17),IDATA(18),UECO,UECO2,
     1      IDATA(19),UEO2,KA
  731 WRITE (IPU,8731) (IDATA(I), I=20,28),EWOLEF,EWAROM,EWHLOA,KA
 8731 FORMAT(2H 2,   3I5,  3X,2(3I5,  1X),3F6.4,I9,1H7)
      WRITE (IPU,8732) X(87),X(88),OILRAT,CFFOIL,EFFOIL,CPCAIR,PCTAIR,
     1                 AFCO2,AFCO,AF,KA
 8732 FORMAT (' 3',2F7.2,T25,3F6.3,2F6.1,3F6.2,I9,'7')
C
 7255 DO 7015 JJJ=1,NCOMM
      I = 8
      IF (JJJ - NCOMM) 7015,7256,7256
 7256 I = 9
 7015 WRITE (IPU,9001) (HOLL(JJJ,J), J=1,18),KA,I
 9001 FORMAT (1X,A1,17A4,I9,I1)
      RETURN
      END
/*
```

Appendix 5a

LOAD CARDS FOR TRAILER IBM 360; MODEL 30; 32K CORE

```
// JOB TRAILER  PHS SURVEILLANCE DATA PROCESSOR
// ASSGN SYS004,X'191'
// ASSGN SYS009,X'191'
// ASSGN SYS010,X'191'
// ASSGN SYS011,X'191'
// VOL SYS004,UOUT
// DLAB 'DELS SCRATCH AREA 7                            IGWTDSK',         6
              0001,67001,67001,'                      ',SD
// XTENT 001,000,000001000,000010009,'GWTDSK',SYS004
// EXEC CLRDSK
// UCL B=(K=0,D=240),X'40',ON
// END
// VOL SYS009,UOUT
// DLAB 'SURV.OUTPUT                                    IGWTDSK',         6
              0001,67001,67001,'                      ',SD
// XTENT 001,000,000011000,000100009,'GWTDSK',SYS009
// EXEC CLRDSK
// UCL B=(K=0,D=133),X'40',ON
// END
// VOL SYS010,UOUT
// DLAB 'PHS SURVEILLANCE DATA                          IGWTDSK',         6
              0001,67001,67001,'                      ',SD
// XTENT 001,000,000101000,000177009,'GWTDSK',SYS010
// EXEC CLRDSK
// UCL B=(K=0,D=828),X'40',ON
// END
// VOL SYS011,UOUT
// DLAB 'PHS SURVEILLANCE DATA DICTIONARY               IGWTDSK',         6
              0001,67001,67001,'                      ',SD
// XTENT 001,000,000178000,000191009,'GWTDSK',SYS011
// EXEC CLRDSK
// UCL B=(K=0,D=80),X'40',ON
// END
// VOL SYS004,IJSYS04
// DLAB 'DELS SCRATCH AREA 7                            IGWTDSK',         6
              0001,67001,67001,'                      ',SD
// XTENT 001,000,000001000,000010009,'111111',SYS004
// VOL SYS009,IJSYS09
// DLAB 'SURV.OUTPUT                                    IGWTDSK',         6
              0001,67001,67001,'                      ',SD
// XTENT 001,000,000011000,000100009,'GWTDSK',SYS009
// VOL SYS010,IJSYS10
// DLAB 'PHS SURVEILLANCE DATA                          IGWTDSK',         6
              0001,67001,67001,'                      ',SD
// XTENT 001,000,000101000,000177009,'GWTDSK',SYS010
// VOL SYS011,IJSYS11
// DLAB 'PHS SURVEILLANCE DATA DICTIONARY               IGWTDSK',         6
              0001,67001,67001,'                      ',SD
// XTENT 001,000,000178000,000191009,'GWTDSK',SYS011
// EXEC TRAILER
 FIRST   SECOND  THIRD   FOURTH  FIFTH   SIXTH   SEVNTH  EIGHTH  NINTH      31X
 NONE    C.A.P.  A.I.R.  CL UP   FB 1    FB 2
  2  3 14 15 18 19 22 25 26 51 52 55 36 37 46 48 29 30 33 63 64 65 66 67 68 69
70 71
        1      CHEV
```

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Appendix 5a

```
      2          FORD
      3          PLYM
      4          PONT
      5          MAKE
      6          MAKE
      7          MAKE
      8          MAKE
      9          MAKS
    = 1
      1          DENV
      2          HOUS
      3          MINN
      4          PHNX
      5          CIN ROAD
      6          CIN DYNA
      7          CITY
      8          CITY
      9          TERN
    = 1
      1                RUN NO.
      2                SAMPLER
      3                CU FT/C1
      4                ODOM
      5                MILES
      6                MINUTES
      7                CALC MPH
      8                N DILRAT
      9                C A/F
     10                N EX/AIR
     11                SCF AIR
     12                SCFEX IN
     13                DELTA P1
     14                CPM 1
     15                CT N2
     16                GT OF N
     17                GT CF N
     18                DE HC IR
     19                DE HC FI
     20                DE CO
     21                DE CO2
     22                DE NOX
     23                DE O2
     24                DELTA P2
     25                CPM 2
     26                CT SAMP
     27                GT OF S
     28                GT CF S
     29                UE HC IR
     30                UE HC FI
     31                UE CO
     32                UE CO2
     33                UE NOX
     34                UE O2
     35                DELTA P3
     36                CPM 3
     37                CT CAN3
     38                GT OF C
```

Appendix 5a

39	DT EF G
40	EW HC IR
41	EW HC FI
42	EW CO
43	EW CO2
44	EW NOX
45	RATIO
46	T AMB
47	P AMB
48	HUMIDITY
49	C EX/AIR
50	L SCF EX
51	CE HC IR
52	CE HC FI
53	CE CO
54	CE CO2
55	CE NOX
56	CTS/MIN
57	CW HC IR
58	CW HC FI
59	CW CO
60	CW CO2
61	CW NOX
62	DE H L D
63	DE OLEF
64	DE AROM
65	UE H L D
65	DE H LOA
66	UE OLEF
67	UE AROM
68	UE PAR
69	CE OLEF
70	CE AROM
71	CE PAR
72	EW OLEF
73	EW AROM
74	EW PAR
75	CW OLEF
76	CW AROM
77	CW PAR
78	A/F CO2
79	A/F CO
80	A/F AVE.
81	C PCTAIR
82	N PCTAIR
83	N MI/GAL
84	C MI/GAL
85	C DTLRAT
86	EFF OIL
87	A/F DIFF
88	A/F DIFF
89	NOT USED
90	NOT USED
91	NOT USED
92	NOT USED
93	NOT USED
94	NOT USED

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```
    95             NOT USED
    96             NOT USED
    97             NOT USED
    98             NOT USED
    99             NOT USED
    -1
     1             66.0                                               ETHYL
     2             63.0                                               ETHYL
     3             66.0                                               ETHYL
     4             63.0                                               ETHYL
     5              0.0                                               DUMMY
     6             63.0                                               ETHYL
     7             67.2                                               PHS-LINE
     8             60.5                                               PHS-LINE
     9              0.0                                               DUMMY
    -1
     1                   0.0001            9999.0
     2                   1.0                  9.0
     3                   0.0                  1.0
     4                  50.00              9999.9
     5                   3.0                  9.0
     6                   8.0                 35.0
     7                   0.0                 50.0
     8                   0.0                  6.0
     9                   0.0                20.0
    10                   0.0                  1.5
    11                   0.0                200.0
    12                   0.0                200.0
    13                   0.1                  0.3
    14                  35.0                110.0
    15                1000.0               8000.0
    16                 -20.0                130.0
    17                   0.0                  2.0
    18                 150.0               4000.0
    19                 200.0               8000.0
    20                   0.0                  5.0
    21                   1.5                 10.0
    22                  30.0               2000.0
    23                   0.1                  6.0
    24                   0.3                  0.5
    25                  75.0                200.0
    26                100.0                4200.0
    27                 -20.0                120.0
    28                   0.0                  2.0
    29                   0.0              10000.0
    30                   0.0              15000.0
    31                   0.0                 10.0
    32                   0.0                 20.0
    33                   0.0               5000.0
    34                   0.0                 20.0
    35                   0.6                  0.9
    36                 150.0                400.0
    37                 100.0               4200.0
    38                 -20.0                160.0
    39                   0.0                  2.0
    40                   0.0                  0.1
    41                   0.0                  0.1
```

Appendix 5a

```
       42                  0.0                      0.6
       43                  0.0                      2.0
       44                  0.0                      0.1
       45                  0.0                      1.2
       46                -30.0                    120.0
       47                 21.0                     32.0
       48                  0.0                    100.0
       -1
        1           1          9
        2           1          9
        3           1          9
        4           1          9
        5           1          9
        6           1         49
        7           1          9
        8           0          0
        9           1          9
       -1                                                              99998
```

APPENDIX 5b

PROGRAM SELECT

```
// JOB  SELECT  COMPILE SELECT
// OPTION CATAL
 PHASE SELECT,*
// EXEC FORTRAN
C
C
      DOUBLE PRECISION ALIST(2,100),RUN,CARLIC,H(4),REC(2),RECN
      DOUBLE PRECISION DEVICE(4),VNAME(40),UNAME(40)
      DIMENSION CMAKE(4),AVE(40),SSDEV(40),SD(40)
      DIMENSION IX(150),NTEST(9),LIST(7,12),K(7),LVAR(40),LISTD(50),L(4)
      DIMENSION X(150),Y(50),SUM(40),SSQ(40),JFIRST(5),IDIAG(10)
      COMMON ALIST,H,DEVICE,VNAME,UNAME,REC,RECN
      COMMON IDUMMY(9,8),JTRANS(11)
      COMMON NTEST,LIST,K,LVAR,LISTD,L
      COMMON NVAR,KVAR,NVART,MVART,NRUNS,IDELS,IDISK,JDISK,KDISK
      COMMON IDICT,KDICT,I,JDELS,ISCRAT,IDIAG,LFIRST,LLAST
      COMMON JOMIT,KFIRST(10),KLAST(10)
      COMMON IFIRST,ILAST
      COMMON CMAKE,X,Y,SUM,SSQ
      EQUIVALENCE (L(1),ICITY),(L(2),IVISIT),(L(3),JDEV),(L(4),IMAKE)
      EQUIVALENCE (X(1),AVE(1)),(X(51),SSDEV(1)),(X(101),SD(1))
      EQUIVALENCE (X(1),IX(1))
      EQUIVALENCE (H(1),RUN),(H(2),CARLIC)
C
C     PROGRAM SELECT
C
C     G. W. THOMSON, ETHYL, DETROIT
C     AUG. 1, 1969 ... MODIFIED TO REJECT SELECTED RECORDS
C
C     SELECT AND PREPARE FOR PROCESSING STORED EMISSION DATA
C
C     ITYPE = 1 TO 5    RETRIEVE CHOSEN DATA FROM DISK USING DICTIONARY
C                          STORE IN A DELS FILE IF WANTED
C
C     ITYPE = 1         STORE USING A STANDARD DISCRIMINATOR
C     ITYPE = 2            TABLE WITH AVERAGES PER MAKE-CITY-VISIT
C     ITYPE = 3         STORE USING DISCRIMINATOR CARDS
C     ITYPE = 4            TABLE WITH AVERAGES PER MAKE-CITY-VISIT
C     ITYPE = 5            TABLE WITHOUT AVERAGES
C     ITYPE = 6-10         OPEN
C
C     DELS DATA ARE STORED UNLESS NDELS1 = -1
C
C
C
      DEFINE FILE  7 (2200,60,U,IDELS)
C                                       STORE FOR DELS PROCESSING
C                                          CYL.  1 - 20
      DEFINE FILE  8 (2200,60,U,IEIGHT)
C                                       PART OF LARGER DELS SYSTEM
C                                          CYL. 21 - 40
      DEFINE FILE  9 (60,60,U,ININE)
C                                       PART OF LARGER DELS SYSTEM
C                                          CYL. 41
      DEFINE FILE 10 (120,280,U,ISCRAT)
C                                       INTERNAL SCRATCH AREA
C                                          CYL. 42 - 45
```

```
      DEFINE FILE 13 (3000,307,U,IDISK)
C                                              PHS SURVEILANCE DATA
C                                                 CYL. 101 - 177
      DEFINE FILE 14 (3000,20,U,IDICT)
C                                              PHS SURVEILANCE DICTIONARY
C                                                 CYL. 178 - 191
C
C
C
      ICO = 1
      IPR = 3
      JFIRST(1) = 1393
      JFIRST(2) =  697
      JFIRST(3) = 1777
      JFIRST(4) =  947
      JFIRST(5) =    1
C
C
C     MAKES     RIGHT-JUSTIFIED COL.  8,16,24,32
C     DEVICES   RIGHT-JUSTIFIED COL.  44,56,68,80
C     IDISK, IDICT              COL.   8,16
C
  701 READ (ICO,9701) (CMAKE(I),I=1,4), (DEVICE(I),I=1,4), REC(1),REC(2)
 9701 FORMAT (4(4X,A4),4(4X,A8)/2(I4,A5))
C
C     DUMMY VARIABLES ARE C1,C2,M1,M2,I11,I12,I21,I22
C        I.E.  CITY, MAKE, AND INTERACTION
C        C3,M3,I13,I23,I31,I32,I33 BY DIFFERENCE
C
      DO 802 I=1,9
  802 READ (ICO,904) (DUMMY(I,J), J=1,8)
      READ (ICO,904) (JTRANS(I), I=1,11)
C
C     CLEAN NTEST(1) TO ILAST  FOR DEBUG  ...  SEE COMMON LISTS
C
C     NOTE THAT I CANNOT BE USED AS AN INDEX
C        SINCE IT IS CLEANED OUT
C
  600 DO 601 J=1,236
  601 NTEST(J) = 0
      RECN = REC(1)
      NDELS1 = -1
      IHEAD = 1
      ISCRAT = 1
      MVAR = 1
C
C     LFIRST, LLAST ARE SEARCH LIMITS FOR DISK REC. NO.
C        NO RECORD ACCEPTED OUTSIDE THESE LIMITS
C        IDIAG( ) DIAGNOSTIC CODES IN COL. 71 - 80
C     JOMIT IS NO. OF SETS OF PAIRS OF RECORD NUMBERS  ... MAX. 10
C        COL. 39-40
C     DO NOT INCLUDE DATA BETWEEN THESE PAIRS,  ENTERED ON NEXT CARDS
C
    1 READ (ICO,910) LFIRST,LLAST,ITYPE,JOMIT,I,I,I,
     1                                           (IDIAG(I), I=1,10)
  910 FORMAT (7I10,10I1)
C
```

```
      IF (JOMIT ) 830,830,826
  826 DO 828 IOMIT = 1,JOMIT
  828 READ (ICD,910) KFIRST(IOMIT),KLAST(IOMIT)
C
  830 IF (ITYPE) 2,2,3
    2 ITYPE = 5
    3 GO TO (700,700,9,9,9,711,711,711,711,711),ITYPE
C
C     ITYPE = 1,2 SETS UP A STANDARD DISCRIMINATOR SET FOR TABLE MAKING
C                 NEEDS CARDS FOR VARIABLES AND DELS CONTROL
C
  700 DO 706 I=1,9
      IF (I - 6) 702,702,704
  702 NTEST(I) = 1
      GO TO 706
  704 NTEST(I) = -1
  706 CONTINUE
      NTEST(6) = 10
C
      DO 708 J=1,10
  708 LIST(6,J) = J
  710 NVAR = 6
      GO TO 41
C
  711 JST = 711
      GO TO 14
C
C
C
C     DISCRIMINATOR CARDS
C
C        LEAD CARD HAS NUMBER OF DISCRIMINATORS PER SET OR -1
C        NINE ENTRIES ... DEFAULTS TO -1       I4
C           IF -1 IGNORE THAT SET AS A DISCRIMINATOR CRITERION
C
C     C,V,D,M,-1,CAR NO.,REPEATS,RUN NO.,CAR LIC. NO.
C
    9 READ (ICD,904) (NTEST(I), I=1,9)
  904 FORMAT (20I4)
C
C     DISCRIMINATOR SETS     K(1) TO K(7)
C        COL. 10 OF FIRST CARD OF EACH SET MUST HAVE SET NO.
C        CARD FORMAT I10,2X,17I4
C
      DO 20 ICODE=1,7
      NN = NTEST(ICODE)
      IF (NN) 20,19,10
   10 READ (ICD,911) JJ,(LIST(JJ,J),J=1,NN)
  911 FORMAT (I10,2X,17I4)
      IF (ICODE - JJ) 311,20,311
  311 JST = 10
C
   12 WRITE (IPR,912) JJ
  912 FORMAT(' BAD RUN LIST CARD ',I10)
C                                             ALL CALL-EXITS TO HERE
   14 WRITE (IPR,914)  JST
  914 FORMAT (' CALL EXIT  ... ST.',I5)
```

```
      IF (IDIAG(I)) 16,16,15
   15 CALL  PDUMP (NTEST(1),ILAST,4,X(1),X(18),5,Y(1),Y(18),5)
   16 CALL EXIT
C
   19 NTEST(ICODE) = -1
   20 CONTINUE
C
      DO 28 KCODE=1,2
C
C     SERIAL NO. 8 OR 9  COL. 10
C
C     RUN NUMBERS IN THIS FORMAT       3P26C...
C     CAR LICENCE NUMBERS              ..33044.
C       WHERE ... MEANS BLANKS
C       EACH ENTRY  RIGHT-JUSTIFIED TO COL. SHOWN
C        FIRST CARD    COL. 20, 30, ETC       COL. 1-10   I10
C        FOLL. CARDS   COL. 10, 20, 30, ETC.
C
      ICODE = KCODE + 7
      NN = NTEST(ICODE)
      IF (NN) 28,27,26
   26 READ (ICD,930)  JJ,(ALIST(JJ,J), J=1,NN)
  930 FORMAT (I10,9(2X,A8)/(2X,A8,2X,A8,2X,A8,2X,A8,2X,A8,
     1                      2X,A8,2X,A8,2X,A8,2X,A8,2X,A8))
      IF (ICODE - JJ) 327,28,327
  327 JST = 26
      GO TO 12
   27 NTEST(ICODE) = -1
   28 CONTINUE
C
C     VARIABLE LIST TO SELECT VARIABLES
C        IGNORE IF NVAR, ON FIRST CARD, IS NEG.
C     UP TO 6 VARIABLES,  LISTED FIRST, FOR TABLE
C        SERIAL NO.     I10      1 - 40
C        VARIABLE NO.   I10
C        VAR. NAME      2X,A8
C        VAR. UNITS     2X,A8
C
   40 READ (ICD,910) NVAR
C                                         NVAR, VARIABLES FROM CARDS
      IF (NVAR) 50,53,441
  441 IF (NVAR - 35) 41,41,53
   41 MVAR = NVAR + 5
C                                         MVAR, TOTAL VARIABLES
      NVART = 6
      IF (NVAR - 6) 442,443,443
  442 NVART = NVAR
C                                         NVART, TABLE VAR. WITH TITLES
  443 MVART = NVART + 5
C                                         MVART, TABLE VARIABLES TOTAL
C
      DO 44 I=1,NVAR
      READ (ICD,941) JJ,KK,H(1),H(2)
  941 FORMAT (2I10,2X,A8,2X,A8)
      IF (I - JJ) 342,42,342
  342 JST = 41
      GO TO 54
   47 LVAR(I) = KK
      VNAME(I) = H(1)
   44 UNAME(I) = H(2)
C
C
C     LIST OF VARIABLES TO GO INTO A DELS FILE
C
C     DELS SER. NO.  NDELS1 TO NDELS2
C        NOTE THAT THE DELS 1,0 IS IN NDELS2 + 1
C     NDELS3 = 1 FOR SPECIAL FILL OF DUMMY VARIABLES
C                ALSO: LOG BASE 10 TRANSFORM OF ELEVEN VARIABLES
C                ALSO: ODOMETER MILES SCALED BY 10000
C     NDELS1 = -1 FOR NO DELS LOAD
C
   50 READ  (ICD,910) NDELS1,NDELS2,NDELS3
      IF (NDELS1) 720,350,49
  350 JST = 50
      GO TO 54
   49 IF (NDELS2 - 50) 51,51,349
  349 JST = 49
      GO TO 54
   51 IF (NDELS3) 351,58,52
  351 JST = 51
      GO TO 54
   52 IF (NDELS1 - 9) 352,58,58
  352 JST = 52
      GO TO 54
   53 JJ = NVAR
      JST = 49
   54 WRITE (IPR,954) NDELS1,NDELS2,NDELS3,JJ
  954 FORMAT (' BAD DELS CONTROL OR VAR. CARD',4I6)
      GO TO 14
   58 DO 59 I=1,NDELS1
C                              THIS IS A DUMMY
   59 LISTD(I) = 7
      READ  (ICD,906)  (LISTD(I), I=NDELS1,NDELS2)
      DECN = REC(2)
      IDELS = 1
C
C     END OF DISCRIMINATOR LOAD
C
  720 IF (IDIAG(2)) 1722,1722,1721
 1721 CALL  PDUMP (NTEST(1),ILAST,4,X(1),X(18),5,Y(1),Y(18),5)
C
C     START MAKE-CITY-VISIT-DEVICE LOOPS
C
 1722 DO 758 IMAKE = 1,3
      DO 756 ICITY = 1,5
      DO 754 IVISIT = 1,4
      IF (IVISIT - 4) 726,722,722
  722 IF (ICITY - 2) 754,726,724
  724 IF (ICITY - 4) 754,726,726
  726 IFIRST = JFIRST(ICITY) + 135*(IVISIT - 1)
      ILAST = JFIRST(ICITY) + 135*IVISIT
      IF (IFIRST - LLAST) 727,727,754
  727 IF (ILAST - LFIRST) 754,728,728
  728 DO 752 IDEV = 1,2
```

```
      JDEV = IDEV
      IF (IDEV - 2) 750,730,730
  730 IF (IMAKE - 2) 732,732,740
  732 JDEV = 1
C                                 A.I.R.
C
  740 GO TO (742,742,100,100,100,711,711,711,711,7111),ITYPE
C
  742 LIST(1,I) = ICITY
      LIST (2,I) = IVISIT
      LIST (3,I) = JDEV
      LIST (4,I) = IMAKE
C
  100 DO 5 I=1,NVAR
      Y(I) = 0.0
      SUM(I) = 0.0
    5 SSU(I) = 0.0
      NRUNS = 0
C
      GO TO (612,300,612,300,300,711,711,711,711,7111),ITYPE
C
C                                          HEADING
C
  300 IF (IHEAD) 612,612,301
  301 WRITE (IPR,9300)
 9300 FORMAT ('1')
      WRITE (IPR,9302) (VNAME(I), I=1,NVART)
 9302 FORMAT (' RECORD',
     1        ' RUN   MAKE   DEVICE',T30,'LICENSE',T38,'CAR',
     2        T42,'MILES  A/F  AMB. HUMID CARB',
     3        3X,A8,3X,A8,2X,A8,2X,A8,    A8,3X,A8)
      WRITE (IPR,9304) RECN,(UNAME(I), I=1,NVART)
 9304 FORMA  (1X,A5,1X,T32,'NO.',T38,'NO.',T42,'ODOM',
     1        T56,'TEMP  PCT  TEMP',
     1        3X,A8,3X,A8,2X,A8,2X,A8,    A8,3X,A8)
      WRITE (IPR,9991)
 9991 FORMAT (1X)
C
C     RECRD-BY-RECORD TEST AND PICK UP LOOP
C
  612 DO 130 KDICT=IFIRST,ILAST
      IF (KDICT - LFIRST) 130,613,613
  613 IF (KDICT - LLAST)  614,614,130
C
  614 IF (JOMIT) 814,814,800
C                                 TEST FOR EXCLUDED RECORDS
  800 DO 804 IOMIT = 1,JOMIT
      IF (KDICT - KFIRST(IOMIT)) 814,130,803
  803 IF (KDICT - KLAST (IOMIT)) 130,130,804
  804 CONTINUE
C
  814 READ (14'KDICT) KDISK,RUN,CARLIC,(K(I),I=1,7)
C
      IF (IDIAG(10)) 760,760,618
  618 WRITE (IPR,9618) KDISK,RUN,CARLIC
 9618 FORMAT (T116,'RECORD',I10/T116,'RUN      ',A8/
     1        T116,'LICENSE ',A8)
```

```
C
  760 IF (K(3) - 1) 620,620,762
  762 IF (K(4) - 3) 764,620,620
  764 K(3) = 3
C                                           K(3) = 3 FOR A.I.R. CARS
  620 DO 106 ICODE=1,7
      NN = NTEST(ICODE)
      IF (NN) 106,106,102
  102 KK = K(ICODE)
C
      DO 104 ITEST=1,NN
      IF (KK - LIST(ICODE,ITEST)) 104,103,104
  103 IF (ICODE - 4) 105,105,106
  105 IF (KK - L(ICODE)) 630,106,630
  104 CONTINUE
      GO TO 630
  106 CONTINUE
C
  108 DO 116 KCODE=1,7
      NN = NTEST(KCODE + 7)
      IF (NN) 116,116,112
  112 HH = H(KCODE)
C
      DO 114 ITEST=1,NN
      IF (HH - ALIST(KCODE,ITEST)) 114,116,114
  114 CONTINUE
C                                           NOT-IN-LIST EXIT
  630 IF (IDIAG(3)) 633,633,632
  632 WRITE (IPR,9632)
 9632 FORMAT (T126,'NOT IN')
  633 IF (IDIAG(5)) 130,130,634
  634 CALL  PDUMP (NTEST(1),ILAST,6,X(1),X(18),5,Y(1),Y(18),5)
      GO TO 130
  116 CONTINUE
      NRUNS = NRUNS + 1
C                                           COUNTS RUNS FOUND
      IF (IDIAG(4)) 637,637,636
  636 WRITE (IPR,9636)
 9636 FORMAT (T130,'IN')
  637 IF (IDIAG(6)) 120,120,638
  638 CALL  PDUMP (NTEST(1),ILAST,6,X(1),X(18),5,Y(1),Y(19),5)
  120 JDISK = KDISK
C                                  SAVES JDISK POINTER FOR DATA
C
      READ (13'KDISK) (X(I),I=1,150)
C                                           RETRIEVE DATA
      IF (NDELS1) 308,350,200
C
C     STORE DATA IN DELS FILE IF NDELS1 NOT NEGATIVE
C
  200 DO 204 I=1,50
  204 Y(I) = 0.0
C
  206 DO 208 I=NDELS1,NDELS2
      JDELS = LISTP(I)
  208 Y(I) = X(JDELS)
      Y(NDELS2 + 1) = 1.0
```

```
C
C     LOAD DUMMY VAR. FOR CITY-MAKE COMBINATIONS
C        IF NDELS3 IS NOT ZERO
C
C        CITIES = 2,4,6       K(1)    KK = 0,1,2
C        DEVICES= 2,4         K(3)
C        MAKES  = 1,2,3       K(4)
C
      IF (NDELS3) 245,245,212
C                                                 DEVICE CHECK
  212 IF (K(3) - 2) 222,216,214
  214 IF (K(3) - 4) 216,222,222
C                                                 CITY CHECK
  216 KK = K(1) - 1
      IF (K(1)-2) 222,223,218
  218 IF (K(1)-4) 222,224,220
  220 IF (K(1)-6) 224,222,222
C
  222 WRITE (IPR,9222) K(1),K(3)
 9222 FORMAT (' BAD CITY-DEVICE CODES',2I4)
      JST = 222
      GO TO 14
C
  223 KK = 0
  224 JJ = 3*KK + K(4)
      DO 230 I=1,8
  230 Y(I) = IDUMMY(JJ,I)
C
C     LOG TRANSFORMS OF MILES,HC-FID,HC-IR,NOX,CO AND CO2
C
      DO 231 I=1,11
      JJ = JTRANS(I)
  231 Y(I+29) = ALOG10 (X(JJ))
C                                                 SCALE ODOMETER MILES BY 10000
      Y(9) = X(4)/10000.0
      Y(41) = 1.0
C
  245 IF (IDIAG(7)) 247,247,246
  246 CALL  POUMP (NTEST(1),ILAST,4,X(1),X(18),5,Y(1),Y(18),5)
  247 JDELS = IDELS
C                                   SAVES DELS DISK POINTER
C
  250 WRITE (7'IDELS) (Y(I), I=1,50)
  308 GO TO (130,310,130,310,310,711,711,711,711,711),ITYPE
C
  310 Y(1) = X(4)
      Y(2) = X(9)
      Y(3) = X(66)
      Y(4) = X(48)
      Y(5) = X(38)
C
      DO 312 I=1,NVAR
      KK = LVAR(I)
  312 Y(I + 5) = X(KK)
C
      KK = K(4)
      H(3) = CMAKE(KK)
      KK = K(3)
      H(4) = DEVICE(KK)
      DO 314 I=1,MVAR
      SUM(I) = SUM(I) + Y(I)
  314 SSQ(I) = SSQ(I) + Y(I)*Y(I)
C
      J = JDISK
      IF (NDELS1) 320,390,319
  319 J = JDELS
  320 WRITE(IPR,9320)J,RUN,H(3),H(4),CARLIC,K(6), (Y(I), I=1,MVAR)
 9320 FORMAT (I6,1X,A5,2X,A4,2X,A8,1X,A7,
     1                              T3,F7.0,F6.2,2F5.0,F6.0,2X,
     2          3(F9.2,F11.4))
C
  136 CONTINUE
C                                              EXIT AFTER LAST RECORD
      IHEAD = NRUNS
      RUNS = NRUNS
      GO TO (752,330,752,330,752,711,711,711,711,711),ITYPE
C
C                                              AVERAGES AND STD. DEVN.
  330 IF (NRUNS) 752,752,331
  331 DO 334 I=1,MVAR
      AVE(I) = SUM(I)/RUNS
      SSDEV(I) = SSQ(I) - AVE(I)*SUM(I)
      IF (SSDEV(I)) 332,332,333
  332 SSDEV(I) = 0.0
      SD(I) = 0.0
      GO TO 334
  333 SD(I) = SQRT(SSDEV(I)/(RUNS - 1.0))
  334 CONTINUE
C
      JJ = ISCRAT
      WRITE (10'ISCRAT) JJ,IMAKE,ICITY,IVISIT,IDEV,RUNS,
     1          (J,AVE(J),X(J),SUM(J),SSQ(J),SSDEV(J), J=1,MVAR)
C
      WRITE (IPR,9340) (AVE(I), I=1,MVAR)
      WRITE (IPR,9342)  (SD(I), I=1,MVAR)
 9340 FORMAT(/' AVERAGE',           T38,F9.0,F6.2,2F5.0,F6.0,2X,
     1          3(F9.2,F11.4))
 9342 FORMAT (' STD. DEVIATION',  T38,F9.0,F6.2,2F5.0,F6.0,2X,
     1          3(F9.2,F11.4))
  390 WRITE (IPR,9390) NRUNS,IFIRST,ILAST
 9390 FORMAT  (//I5,' RUNS ... RECORDS',I5,' TO',I5//)
C
  752 CONTINUE
  754 CONTINUE
  756 CONTINUE
  758 CONTINUE
C
      IF (IDIAG(8)) 765,765,763
  763 CALL  PDUMP (NTEST(1),ILAST,4,X(1),X(18),5,Y(1),Y(19),5)
  765 IF (NDELS1) 600,390,16
C                                  600 RECYCLES TO START OF PROGRAM
C                                  16  TO CALL EXIT WITHOUT PDUMP OPTION
      END
/*
```

APPENDIX 6

SELECTED DATA LISTING

MICRO RUN IDNO		MAKE	DEVICE	[illegible] WT.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO PER CENT	CO LB/MILE	NOX PPM	NOX LB/MILE
1	[illegible]	CHEV	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	CHEV	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	CHEV	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	CHEV	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	CHEV	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	CHEV	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	CHEV	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	CHEV	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	CHEV	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	CHEV	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	CHEV	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	CHEV	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	CHEV	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	CHEV	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	CHEV	A.I.R.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	CHEV	A.I.R.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	CHEV	A.I.R.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	CHEV	A.I.R.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	CHEV	A.I.R.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	CHEV	A.I.R.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 RUNS — [illegible]

RECORD INDEX	RUN	MAKE	SERVICE	LICENSE NO.	CAR NO.	MILES 100P	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO PER CENT	CO LB/MILE	NOX PPM	NOX LB/MILE
21	2410B	CHEV	A.I.A.	30084	1	6552.	13.26	67.	87.	92.	3674.16	0.0126	2.60	0.1780	1240.83	0.0346
22	2410C	CHEV	A.I.A.	30084	1	6561.	13.29	64.	81.	88.	3787.76	0.0118	2.78	0.1754	1023.72	0.0326
23	2417B	CHEV	A.I.A.	30082	2	6607.	14.26	69.	81.	95.	2851.35	0.0075	1.38	0.0695	1182.47	0.0318
24	2417C	CHEV	A.I.A.	30082	2	6616.	14.11	69.	81.	95.	3041.49	0.0077	1.26	0.0657	1089.44	0.0090
25	2420B	CHEV	A.I.A.	31366	3	7504.	14.07	76.	62.	74.	4124.29	0.0106	1.28	0.0541	1716.39	0.0119
26	2420C	CHEV	A.I.A.	31366	3	7514.	13.92	76.	62.	90.	4251.91	0.0093	1.44	0.0667	1522.28	0.0123
27	2422B	CHEV	A.I.A.	30085	4	7621.	14.28	82.	95.	116.	3512.07	0.0091	1.15	0.0681	1319.32	0.0115
28	2422C	CHEV	A.I.A.	30085	4	7656.	13.96	82.	95.	118.	3455.37	0.1089	1.44	0.0746	1166.55	0.0099
29	2433B	CHEV	A.I.A.	30083	5	6451.	13.85	90.	56.	110.	3610.02	0.0069	1.57	0.0606	1197.56	0.0076
30	2435C	CHEV	A.I.A.	30083	5	6468.	13.66	87.	65.	115.	3647.26	0.0082	1.88	0.0814	4266.24	0.0090
31	2440B	CHEV	A.I.F.	30080	6	6599.	13.48	95.	64.	115.	3271.40	0.0071	1.50	0.0660	1425.07	0.0126
32	2440C	CHEV	A.I.A.	30080	6	6594.	13.86	95.	65.	106.	3076.91	0.0069	1.55	0.0701	1670.61	0.0127
33	2442B	CHEV	A.I.A.	30082	7	6796.	13.45	85.	76.	115.	3981.73	0.0107	2.38	0.1285	862.41	0.0076
34	2442C	CHEV	A.I.A.	3008C	7	6618.	13.62	90.	68.	115.	3858.72	0.0094	1.99	0.1069	999.62	0.0075
35	2444B	CHEV	A.I.A.	30096	8	9557.	13.44	91.	75.	106.	3095.85	0.0078	2.36	0.1202	685.62	0.0057
36	2444C	CHEV	A.I.A.	30096	8	9548.	13.51	86.	72.	110.	2946.99	0.0076	2.23	0.1162	666.89	0.0057
37	2450B	CHEV	A.I.A.	30087	9	13648.	13.91	92.	72.	108.	3129.66	0.0076	1.48	0.0725	1178.82	0.0086
38	2450C	CHEV	A.I.A.	30087	9	13698.	13.89	86.	61.	105.	2946.60	0.0075	1.58	0.0772	1314.82	0.0111
39	2462B	CHEV	A.I.A.	30841	10	6134.	13.82	90.	74.	105.	2775.24	0.0071	1.62	0.0805	1030.43	0.0087
40	2462C	CHEV	A.I.A.	34291	10	6256.	13.84	95.	72.	105.	2774.69	0.0067	1.51	0.0746	1131.82	0.0092
AVERAGE						7726.	13.79	81.	73.	105.	3369.75	0.0086	1.76	0.0897	1176.01	0.0097
STD. DEVIATION						2414.	7.26	7.	6.	9.	465.12	0.0016	0.40	0.0365	281.06	0.0021

20 RUNS --- RECORDS 412 TO 767

RECORD RUN [illegible]	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	[illegible]	AMB. TEMP	HUMIDITY PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO PER CENT	CO LB/MILE	NOX PPM	NOX LB/MILE
41 [illegible]	CHEV	A.I.R.	[illegible]	1	[illegible]	13.07	68.	71.	85.	3240.15	0.7871	1.54	0.0724	1685.81	0.0127
42 [illegible]	CHEV	A.I.R.	[illegible]	1	[illegible]	13.74	68.	78.	86.	3275.14	0.0883	1.66	0.0844	1485.79	0.0126
43 [illegible]	CHEV	A.I.R.	[illegible]	2	[illegible]	13.65	65.	87.	85.	3422.84	0.0896	1.65	0.0889	1181.27	0.0108
44 [illegible]	CHEV	A.I.R.	[illegible]	2	[illegible]	13.78	65.	87.	87.	3469.43	[illegible]	1.58	0.0839	1423.89	0.0130
45 [illegible]	CHEV	A.I.R.	[illegible]	3	[illegible]	14.18	70.	55.	85.	2634.22	0.0883	1.17	0.0743	1396.88	0.0146
46 [illegible]	CHEV	A.I.R.	[illegible]	3	[illegible]	14.05	77.	57.	88.	2664.45	0.0871	1.31	0.0703	1376.57	0.0121
47 [illegible]	CHEV	A.I.R.	[illegible]	4	[illegible]	13.09	71.	57.	90.	2219.67	0.0866	1.43	0.0834	1321.06	0.0126
48 [illegible]	CHEV	A.I.R.	[illegible]	4	[illegible]	13.92	66.	90.	78.	2198.76	0.0567	1.47	0.0905	1247.80	0.0116
49 [illegible]	CHEV	A.I.R.	[illegible]	5	[illegible]	14.45	66.	40.	82.	2730.19	0.0869	1.76	0.0685	1070.84	0.0155
50 [illegible]	CHEV	A.I.R.	[illegible]	5	[illegible]	13.41	76.	62.	65.	2785.34	0.0268	1.60	0.0746	1301.17	0.0159
1 [illegible]	CHEV	A.I.R.	[illegible]	6	[illegible]	14.29	68.	74.	62.	2583.44	0.0872	1.09	0.0605	2366.16	0.0218
52 [illegible]	CHEV	A.I.R.	[illegible]	6	[illegible]	14.29	68.	71.	92.	2544.57	0.0877	1.26	0.0709	2461.57	0.0242
53 [illegible]	CHEV	A.I.R.	[illegible]	7	[illegible]	13.60	82.	46.	96.	3167.78	0.0875	2.01	0.0957	891.31	0.0070
54 [illegible]	CHEV	A.I.R.	[illegible]	7	[illegible]	13.57	78.	44.	102.	2727.96	0.0768	2.08	0.1044	929.67	0.0077
55 [illegible]	CHEV	A.I.R.	[illegible]	8	[illegible]	13.96	74.	58.	79.	2712.75	0.0874	1.42	0.0779	1740.98	0.0157
56 [illegible]	CHEV	A.I.R.	[illegible]	8	[illegible]	14.38	68.	73.	64.	2389.67	0.0866	1.00	0.0542	1683.88	0.0156
57 [illegible]	CHEV	A.I.R.	[illegible]	9	[illegible]	14.38	74.	58.	67.	3043.78	0.0896	1.36	0.0848	2075.76	0.0212
58 [illegible]	CHEV	A.I.R.	[illegible]	9	[illegible]	13.86	74.	58.	75.	2324.22	0.0887	1.58	0.1005	1981.31	0.0190
59 [illegible]	CHEV	A.I.R.	[illegible]	10	[illegible]	14.25	57.	24.	67.	3064.02	0.0876	1.31	0.0659	1823.89	0.0158
60 [illegible]	CHEV	A.I.R.	[illegible]	10	[illegible]	14.01	57.	24.	80.	2746.67	0.0864	1.35	0.0669	1816.08	0.0152
AVERAGE					24575.	13.86	61.	62.	81.	2815.16	0.0876	1.46	0.0787	1621.91	0.0147
STD. DEVIATION					3455.	0.29	11.	75.	11.	303.38	0.0610	0.27	0.0133	425.12	0.0044

20 RUNS ---- [illegible]

RECORD CODES	RUN	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO PER CENT	CO LB/MILE	NOX PPM	NOX LB/MILE
61	[illegible]	CHEV	A.I.R.	30899	1	56639.	13.16	55.	35.	75.	5529.66	0.0236	3.61	0.2685	1315.07	0.0344
62	[illegible]	CHEV	A.I.R.	30899	1	56640.	13.29	55.	37.	75.	5505.61	0.0232	3.65	0.2750	1325.29	0.0343
63	[illegible]	CHEV	A.I.R.	30898	2	34467.	14.39	56.	42.	75.	3662.13	0.0091	1.01	0.0509	1425.40	0.0337
64	[illegible]	CHEV	A.I.R.	30898	2	34470.	14.17	55.	37.	77.	3689.40	0.0095	1.18	0.0616	1574.76	0.0138
65	[illegible]	CHEV	A.I.R.	30894	3	57636.	13.33	54.	53.	76.	2662.72	0.0109	2.60	0.2256	977.57	0.0079
66	[illegible]	CHEV	A.I.R.	30894	3	57647.	13.40	53.	55.	80.	2615.06	0.0107	2.30	0.2079	971.59	0.0079
67	[illegible]	CHEV	A.I.R.	30890	4	34267.	13.86	57.	80.	78.	2567.80	0.0086	1.57	0.0621	1594.41	0.0129
68	[illegible]	CHEV	A.I.R.	30890	4	34276.	13.93	57.	77.	80.	2516.47	0.0076	1.46	0.0835	1468.07	0.0130
69	[illegible]	CHEV	A.I.R.	30893	5	45595.	14.05	42.	41.	65.	1799.06	0.0066	0.78	0.0475	1366.84	0.0136
70	[illegible]	CHEV	A.I.R.	30893	5	45606.	15.07	45.	41.	68.	1995.38	0.0061	0.67	0.0423	1366.86	0.0156
71	[illegible]	CHEV	A.I.R.	30892	6	29906.	13.11	45.	41.	67.	5525.26	0.0147	3.21	0.1736	1169.73	0.0108
72	[illegible]	CHEV	A.I.R.	30892	6	29915.	13.22	47.	38.	69.	5670.64	0.0166	2.95	0.1744	1498.13	0.0140
73	[illegible]	CHEV	A.I.R.	30891	7	27315.	13.79	47.	35.	74.	2621.30	0.0080	1.67	0.1066	1411.35	0.0085
74	[illegible]	CHEV	A.I.R.	30891	7	27334.	13.86	53.	35.	78.	2734.77	0.0084	1.59	0.0991	1447.17	0.0088
75	[illegible]	CHEV	A.I.R.	30887	8	57551.	13.41	51.	78.	78.	3321.39	0.0086	2.00	0.1073	1443.58	0.0127
76	[illegible]	CHEV	A.I.R.	30887	8	57562.	13.40	54.	75.	78.	3191.07	0.0096	2.02	0.1099	1421.26	0.0128
77	[illegible]	CHEV	A.I.R.	30885	9	31026.	13.89	50.	52.	81.	2946.34	0.0079	1.57	0.0845	1591.18	0.0144
78	[illegible]	CHEV	A.I.R.	30843	9	31036.	13.63	45.	45.	65.	2927.69	0.0083	1.59	0.0900	1651.40	0.0157
AVERAGE						39346.	13.79	56.	46.	75.	3415.25	0.0109	1.91	0.1260	1362.49	0.0127
STD. DEVIATION						11426.	0.37	7.	16.	6.	1267.69	0.0053	0.83	0.0726	196.41	0.0030

[illegible]

RECORD	[illegible]	MAKE	DRIVER	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID GAMC	HC FID LB/MILE	CO MAX CONT	CO LB/MILE	NOX PPM	NOX LB/MILE
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	CHEV	[illegible]	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

RECORD RUN TOOLS	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO PER CENT	CO LB/MILE	NOX PPM	NOX LB/MILE
99 2P58[illegible]	CHEV	A.I.R.	19032	1	7321.	14.20	82.	17.	100.	2937.80	0.0062	1.25	0.0499	1915.73	0.0136
100 2P58C	CHEV	A.I.R.	19032	1	6325.	14.26	86.	24.	107.	2951.16	0.0065	1.32	0.0507	1241.09	0.0137
101 2P108	CHEV	A.I.R.	19026	2	7598.	13.77	95.	12.	106.	3311.40	0.0075	1.70	0.0625	1524.67	0.0130
102 2P10C	CHEV	A.I.R.	19026	2	7616.	13.85	98.	13.	113.	3221.36	0.0062	1.56	0.0624	1252.46	0.0097
103 2P159	CHEV	A.I.R.	19031	3	7224.	13.40	65.	43.	90.	3442.00	0.0089	2.50	0.1246	1202.78	0.0102
104 2P15C	CHEV	A.I.R.	19031	3	7226.	13.56	71.	27.	105.	3197.17	0.0073	2.16	0.1089	1181.98	0.0091
105 2P54[illegible]	CHEV	A.I.R.	19027	4	6800.	13.78	95.	15.	113.	2933.27	0.0062	1.40	0.0498	1853.02	0.0131
106 2P54C	CHEV	A.I.R.	19027	4	6822.	14.34	87.	15.	115.	2704.93	0.0052	1.02	0.0390	1818.33	0.0114
107 2P259	CHEV	A.I.R.	19034	5	7594.	13.79	86.	17.	110.	3024.29	0.0070	1.65	0.0665	1375.80	0.0114
108 2P25C	CHEV	A.I.R.	19034	5	7577.	14.26	89.	15.	112.	2965.97	0.0067	1.30	0.0593	1387.67	0.0100
109 2P30[illegible]	CHEV	A.I.R.	19035	6	8195.	14.12	77.	17.	103.	2462.69	0.0058	1.23	0.0500	1694.55	0.0140
110 2P30C	CHEV	A.I.R.	19035	6	8226.	13.86	80.	26.	104.	2266.25	0.0061	1.41	0.0759	1972.79	0.0174
111 2P56[illegible]	CHEV	A.I.R.	19029	7	8242.	14.10	76.	21.	102.	2971.79	0.0066	1.04	0.0494	1610.30	0.0118
112 2P56C	CHEV	A.I.R.	19029	7	8271.	14.23	82.	18.	103.	2636.72	0.0058	1.13	0.0505	1816.76	0.0133
113 2P37[illegible]	CHEV	A.I.R.	19031	8	6738.	13.86	78.	21.	103.	2812.06	0.0067	1.44	0.0679	1232.59	0.0095
114 2P37C	CHEV	A.I.R.	19031	8	6742.	14.09	82.	18.	105.	2811.96	0.0061	1.26	0.0557	1196.41	0.0087
115 2P59[illegible]	CHEV	A.I.R.	19030	9	8752	14.13	55.	46.	75.	2621.89	0.0068	1.25	0.0652	1996.67	0.0171
116 2P59C	CHEV	A.I.R.	19030	9	8795.	14.27	55.	47.	75.	2577.48	0.0061	1.07	0.0512	1962.45	0.0154
117 2P47[illegible]	CHEV	A.I.R.	19029	10	10426.	13.36	48.	45.	75.	2486.76	0.0056	1.46	0.0659	1441.12	0.0108
118 2P47C	CHEV	A.I.R.	19029	10	10451.	13.86	54.	46.	75.	2643.04	0.0062	1.59	0.0775	1473.64	0.0115
AVERAGE					7752.	13.89	76.	25.	100.	2847.29	0.0066	1.44	0.0670	1585.94	0.0122
STD. DEVIATION					1066.	0.25	14.	21.	13.	296.70	0.0009	0.37	0.0213	297.12	0.0026

20 RUNS ---- RECORDS [illegible] TO [illegible]

RECORD NO.	RUN	NAME	DEVICE	LICENSE NO.	C-V NO.	MILES	A/F	DRY. TEMP	HUMID. ACT	[illegible] TEMP	HC FID GRAMS	HC FID GR/MILE	CO PER CENT	CO GR/MILE	NOX PPM	NOX GR/MILE
119	[illegible]	[illegible]	A.I.A.	75079	1	17644.	14.27	77.	19.	94.	2845.03	0.0069	1.25	0.1602	2361.63	0.2180
120	[illegible]	[illegible]	A.I.A.	75079	1	17606.	13.62	85.	24.	111.	2724.38	0.0065	1.86	0.0966	1942.6[illegible]	0.0154
121	[illegible]	[illegible]	A.I.A.	75035	2	13804.	13.76	77.	26.	94.	2931.33	0.0067	1.76	0.0792	1632.74	0.0122
122	[illegible]	[illegible]	A.I.A.	75035	2	13866.	13.76	82.	22.	102.	2880.50	0.0068	1.76	0.0822	1682.13	0.0125
123	[illegible]	[illegible]	A.I.A.	75025	3	16628.	13.79	74.	24.	92.	2938.6[illegible]	0.0072	1.67	0.0960	1438.70	0.0134
124	[illegible]	[illegible]	A.I.A.	75025	3	16692.	13.81	74.	24.	92.	2980.75	0.0066	1.62	0.0842	1422.21	0.0121
125	[illegible]	[illegible]	A.I.A.	75028	4	19792.	13.81	76.	22.	92.	3501.29	0.0095	1.40	0.0790	1837.60	0.0162
126	[illegible]	[illegible]	A.I.A.	75024	4	19866.	14.29	77.	19.	104.	2986.75	0.0109	1.27	0.0606	[illegible]	0.0134
127	[illegible]	[illegible]	A.I.A.	77729	5	11526.	14.18	85.	25.	104.	2432.67	0.0055	1.25	0.0577	1566.1[illegible]	0.0119
128	[illegible]	[illegible]	A.I.A.	75027	5	11586.	14.21	85.	23.	104.	2304.29	0.0046	1.15	0.0463	1746.81	0.0115
129	[illegible]	[illegible]	A.I.A.	75027	6	11916.	13.89	82.	25.	104.	2756.83	0.0065	1.38	0.0653	1797.10	0.0140
130	[illegible]	[illegible]	A.I.A.	75027	6	11946.	14.07	87.	24.	105.	2669.46	0.0068	1.20	0.0580	1972.91	0.0140
131	[illegible]	[illegible]	A.I.A.	75032	7	13395.	14.27	82.	19.	103.	2624.56	0.0061	1.36	0.0635	2085.40	0.0155
132	[illegible]	[illegible]	A.I.A.	75032	7	13446.	14.13	85.	23.	105.	2761.10	0.0060	1.23	0.0740	2070.62	0.0150
133	[illegible]	[illegible]	A.I.A.	75037	9	16475.	13.59	74.	22.	90.	3040.2[illegible]	0.0068	2.05	0.0926	1476.02	0.0129
134	[illegible]	[illegible]	A.I.A.	75033	9	16488.	13.47	82.	26.	111.	3215.29	0.0072	2.33	0.1046	1378.50	0.0107
135	[illegible]	[illegible]	A.I.A.	75034	10	13616.	13.76	86.	7.	107.	3506.53	0.0076	1.71	0.0746	1893.75	0.0136
136	[illegible]	[illegible]	A.I.A.	75034	10	13645.	14.20	82.	9.	111.	3297.6[illegible]	0.0070	1.26	0.0596	1863.19	0.0135
AVERAGE						14926.	13.90	81.	17.	103.	2904.50	0.0067	1.56	0.0727	1763.31	0.0136
STD. DEVIATION						2171.	0.27	5.	6.	6.	335.36	0.0010	0.33	0.0178	263.25	0.0025

18 RUNS --- RECORDS 119 TO 136

[illegible] RUN SERIES		MAKE	SERVICE	LICENSE NO.	CAR NO.	MILES DRIV	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO MOL CENT	CO LB/MILE	NOX PPM	NOX LB/MILE
157	1C1025	CHEV	A.I.I.A.	35776	1	1737.	14.69	42.	54.	45.	2863.70	0.0055	0.61	0.0324	1485.12	0.0095
158	1C2077	CHEV	A.I.I.A.	35776	1	1761.	15.22	62.	54.	103.	3085.41	0.0055	0.53	0.0296	1745.55	0.0108
159	1C1135	CHEV	A.I.I.A.	29767	2	4431.	14.45	55.	70.	95.	2744.21	0.0061	0.94	0.0422	1192.65	0.0088
160	1C2037	CHEV	A.I.I.A.	29767	2	4436.	14.80	56.	57.	86.	2185.20	0.0058	0.80	0.0335	1122.00	0.0077
161	1C2045	CHEV	A.I.I.A.	35777	3	4363.	14.44	46.	57.	105.	3329.87	0.0063	1.95	0.0366	1326.83	0.0084
162	1C2047	CHEV	A.I.I.A.	35777	3	4384.	14.32	48.	57.	114.	3326.53	0.0061	1.35	0.0356	1237.06	0.0075
163	1C2076	CHEV	A.I.I.A.	29766	4	2408.	14.48	55.	57.	79.	2222.72	0.0054	0.92	0.0449	1066.36	0.0087
164	1C2070	CHEV	A.I.I.A.	29766	4	2437.	14.44	60.	38.	87.	2294.61	0.0050	0.45	0.0475	1228.90	0.0103
165	1C1180	CHEV	A.I.I.A.	35781	5	2442.	14.85	54.	61.	93.	2450.37	0.0057	0.62	0.0388	1244.30	0.0087
166	1C1180	CHEV	A.I.I.A.	35781	5	2471.	14.96	54.	61.	74.	2628.04	0.0059	0.65	0.0290	1234.22	0.0085
167	1C1211	CHEV	A.I.I.A.	35780	6	2916.	14.62	55.	54.	105.	2635.76	0.0060	0.83	0.0304	1337.40	0.0088
168	1C1137	CHEV	A.I.I.A.	35780	6	2941.	14.80	75.	33.	108.	2491.62	0.0060	0.80	0.0296	1236.74	0.0075
169	1C2245	CHEV	A.I.I.A.	35787	7	2939.	13.90	64.	74.	96.	2658.25	0.0062	1.30	0.0409	1310.61	0.0084
170	1C2247	CHEV	A.I.I.A.	35787	7	2946.	14.65	76.	28.	96.	2744.63	0.0061	1.21	0.0395	1268.05	0.0084
171	1C2281	CHEV	A.I.I.A.	35786	8	1435.	14.59	45.	71.	65.	2379.39	0.0055	0.65	0.0408	1325.66	0.0100
172	1C2750	CHEV	A.I.I.A.	35786	8	1462.	14.65	58.	46.	77.	2140.57	0.0053	0.61	0.0396	1316.14	0.0100
173	1C2281	CHEV	A.I.I.A.	35790	9	1486.	14.56	72.	22.	97.	2459.73	0.0053	0.40	0.0380	1247.45	0.0090
174	1C2180	CHEV	A.I.I.A.	35790	9	1508.	14.70	72.	22.	95.	2377.15	0.0052	0.70	0.0317	1224.14	0.0082
175	1C2281	CHEV	A.I.I.A.	35784	10	1473.	14.35	72.	36.	77.	2524.87	0.0057	1.02	0.0431	1140.30	0.0079
176	1C2220	CHEV	A.I.I.A.	35784	10	1486.	14.49	72.	38.	80.	2915.35	0.0062	1.20	0.0459	1306.66	0.0092
AVERAGE						2551.	14.55	61.	51.	93.	2640.81	0.0057	0.90	0.0367	1282.39	0.0090
STD. DEVIATION						1211.	0.28	12.	15.	17.	324.28	0.0004	0.28	0.0050	165.44	0.0010

20 RUNS --- VEHICLES 1 TO 10

RECORD CYCLE	RUN	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES TODAY	A/F	BARO. TEMP	HUMID ACT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO PER CENT	CO LB/MILE	NOX PPM	NOX LB/MILE
177	2C36C	CHEV	A.I.R.	51799	1	9161.	14.47	91.	33.	95.	2634.98	0.0046	0.09	0.0494	2050.23	0.0118
178	2C36D	CHEV	A.I.R.	51799	1	9186.	14.66	81.	35.	102.	2596.21	0.0051	0.80	0.0517	1621.81	0.0106
179	2C32C	CHEV	A.I.R.	51799	2	4325.	13.99	67.	75.	78.	3046.77	0.0061	1.57	0.0437	1384.98	0.0092
180	2C32D	CHEV	A.I.R.	51799	2	4367.	17.49	68.	71.	81.	3191.23	0.0048	1.48	0.0562	1341.26	0.0084
181	2C29C	CHEV	A.I.R.	51776	3	10261.	13.94	67.	41.	96.	2823.80	0.0048	1.44	0.0420	1615.98	0.0115
182	2C29D	CHEV	A.I.R.	51776	3	10296.	13.99	65.	45.	79.	2707.08	0.0056	1.38	0.0378	1836.96	0.0071
183	2C23C	CHEV	A.I.R.	51766	4	4498.	14.29	65.	46.	82.	3501.98	0.0047	1.26	0.0486	1619.20	0.0102
184	2C22D	CHEV	A.I.R.	51766	4	4415.	14.12	65.	45.	85.	3284.73	0.0048	1.23	0.0512	1539.56	0.0105
185	2C27C	CHEV	A.I.R.	51777	5	11464.	14.25	67.	76.	85.	3092.07	0.0044	1.18	0.0469	1447.14	0.0101
186	2C23D	CHEV	A.I.R.	51777	5	11488.	14.14	71.	72.	91.	3699.73	0.0062	1.21	0.0508	1325.43	0.0090
187	2C30C	CHEV	A.I.R.	29767	6	9758.	14.14	70.	48.	71.	3063.96	0.0061	1.11	0.0447	1606.26	0.0126
188	2C30D	CHEV	A.I.R.	29767	6	9781.	13.86	78.	44.	83.	3641.58	0.0057	1.52	0.0508	2004.55	0.0109
189	2C42C	CHEV	A.I.R.	29766	7	9244.	14.59	68.	52.	81.	2724.38	0.0055	0.85	0.0344	2009.73	0.0134
190	2C42D	CHEV	A.I.R.	29766	7	9257.	14.64	71.	33.	96.	2716.57	0.0051	0.42	0.0387	1952.06	0.0121
191	2C34C	CHEV	A.I.R.	51791	8	13274.	13.98	66.	45.	83.	3287.87	0.0050	1.55	0.0551	1547.22	0.0080
192	2C34D	CHEV	A.I.R.	51791	8	13297.	13.98	71.	35.	83.	3196.99	0.0058	1.39	0.0520	1334.48	0.0080
193	2C44C	CHEV	A.I.R.	51780	9	15988.	14.35	67.	79.	98.	4067.41	0.0046	0.78	0.0306	1898.68	0.0119
194	2C44D	CHEV	A.I.R.	51780	9	15996.	13.67	66.	77.	81.	4368.29	0.0091	1.88	0.0702	1784.89	0.0126
195	2C51C	CHEV	A.I.R.	51787	10	8216.	13.96	62.	79.	83.	3302.91	0.0076	1.44	0.0620	1695.88	0.0128
196	2C51D	CHEV	A.I.R.	51787	10	8236.	13.97	67.	56.	82.	3070.29	0.0066	1.41	0.0595	1663.82	0.0116
AVERAGE						9576.	14.14	67.	61.	87.	3203.46	0.0063	1.26	0.0501	1623.29	0.0108
STD. DEVIATION						3924.	0.33	5.	21.	9.	576.91	0.0012	0.30	0.0130	266.91	0.0016

20 RUNS ___ RECORDS 177 TO 196

RECORD RUN DATE	MAKE	SERVICE	LICENSE NO.	CAR #	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO AVG CONC	CO LB/MILE	NOX PPM	NOX LB/MILE
[illegible]	CHEV	A.I.A.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	CHEV	A.I.A.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

RECORD RUN FUEL	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO VOL PERCENT	CO LB/MILE	NOX PPM	NOX LB/MILE
217 [illegible]	[illegible]	A.I.A.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
218 [illegible]	[illegible]	A.I.A.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
219 [illegible]	[illegible]	A.I.A.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
220 [illegible]	[illegible]	A.I.A.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
221 [illegible]	[illegible]	A.I.A.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
222 [illegible]	[illegible]	A.I.A.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
223 [illegible]	[illegible]	A.I.A.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
224 [illegible]	[illegible]	A.I.A.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
225 [illegible]	[illegible]	A.I.A.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
226 [illegible]	[illegible]	A.I.A.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
227 [illegible]	[illegible]	A.I.A.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
228 [illegible]	[illegible]	A.I.A.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
229 [illegible]	[illegible]	A.I.A.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
230 [illegible]	[illegible]	A.I.A.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
231 [illegible]	[illegible]	A.I.A.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
232 [illegible]	[illegible]	A.I.A.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
233 [illegible]	[illegible]	A.I.A.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
234 [illegible]	[illegible]	A.I.A.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
235 [illegible]	[illegible]	A.I.A.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
236 [illegible]	[illegible]	A.I.A.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 RUNS ... RECORDS [illegible]

RECORD [illegible]	RUN	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES DRIVN	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO PCT CONT	CO LB/MILE	NOX PPM	NOX LB/MILE
237	[illegible]	FORD	A.I.A.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
238	[illegible]	FORD	A.I.A.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
239	[illegible]	FORD	A.I.A.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
240	[illegible]	FORD	A.I.A.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
241	[illegible]	FORD	A.I.A.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
242	[illegible]	FORD	A.I.A.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
243	[illegible]	FORD	A.I.A.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
244	[illegible]	FORD	A.I.A.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
245	[illegible]	FORD	A.I.A.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
246	[illegible]	FORD	A.I.A.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
247	[illegible]	FORD	A.I.A.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
248	[illegible]	FORD	A.I.A.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
249	[illegible]	FORD	A.I.A.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
250	[illegible]	FORD	A.I.A.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
251	[illegible]	FORD	A.I.A.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
252	[illegible]	FORD	A.I.A.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
253	[illegible]	FORD	A.I.A.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
254	[illegible]	FORD	A.I.A.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
255	[illegible]	FORD	A.I.A.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
256	[illegible]	FORD	A.I.A.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 RUNS ---- RECORDS [illegible] TO [illegible]

RECORD RUN CODES		MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB COMP	HC FID PPMC	HC FID GM/MILE	CO PER CENT	CO GM/MILE	NOX PPM	NOX GM/MILE
257	2442C	FORD	A.I.A.	31194	1	4421.	15.44	86.	64.	116.	3793.25	0.0101	1.85	0.0466	2041.94	0.0169
258	2442D	FORD	A.I.A.	31194	1	4426.	15.46	90.	64.	115.	3633.11	0.0095	1.89	0.0466	2006.69	0.0157
259	2404B	FORD	A.I.A.	73073	2	9110.	15.40	91.	61.	115.	4423.25	0.0120	2.26	0.1246	2108.64	0.0198
260	2404C	FORD	A.I.A.	73073	2	9115.	15.44	91.	61.	117.	4224.91	0.0106	1.91	0.0456	1999.51	0.0160
261	2412B	FORD	A.I.A.	91079	3	7912.	15.70	94.	59.	121.	4247.50	0.0110	1.87	0.1020	1812.81	0.0167
262	2412C	FORD	A.I.A.	91079	3	7922.	15.46	95.	57.	114.	4048.08	0.0112	1.42	0.0795	1929.38	0.0178
263	2413B	FORD	A.I.A.	31190	4	5547.	14.34	[illegible]	59.	110.	4056.82	0.0107	1.65	0.0940	1783.15	0.0190
264	2413C	FORD	A.I.A.	31190	4	5576.	14.53	[illegible]	84.	96.	3523.25	0.0104	0.89	0.0531	2044.69	0.0201
265	2425B	FORD	A.I.A.	31191	5	11195.	15.50	[illegible]	60.	110.	4005.75	0.0140	2.25	0.1307	1877.40	0.0182
266	2425C	FORD	A.I.F.	31191	5	11205.	15.44	94.	72.	107.	4082.57	0.0124	1.92	0.1026	2255.44	0.0206
267	2429B	FORD	A.I.A.	31107	6	8445.	15.34	81.	67.	105.	4731.86	0.0092	1.58	0.0625	1796.84	0.0136
268	2429C	FORD	A.I.A.	31107	6	8485.	15.87	94.	70.	112.	4443.30	0.0095	1.63	0.0705	1894.85	0.0134
269	2474B	FORD	A.I.A.	31077	7	9053.	15.50	90.	70.	112.	4363.79	0.0112	2.25	0.1166	1971.19	0.0129
270	2427C	FORD	A.I.A.	31077	7	9063.	15.71	75.	62.	98.	4313.10	0.0108	1.79	0.0968	1423.25	0.0148
271	2492B	FORD	A.I.A.	31065	8	9240.	15.59	85.	70.	116.	4396.51	0.0111	2.74	0.1340	1687.13	0.0148
272	2492C	FORD	A.I.A.	31065	8	6244.	15.65	97.	72.	118.	4371.40	0.0111	1.92	0.0987	2046.2	0.0170
273	2446B	FORD	A.I.A.	31026	9	7977.	14.19	86.	63.	120.	3833.29	0.0096	1.27	0.0987	2086.84	0.0175
274	2446C	FORD	A.I.A.	31026	9	7977.	14.19	95.	63.	117.	3864.90	0.0101	1.16	0.0617	2162.07	0.0159
275	2453B	FORD	A.I.A.	31084	10	4665.	17.01	90.	56.	115.	4286.42	0.0128	1.62	0.0902	2082.35	0.0196
276	2453C	FORD	A.I.A.	31084	10	4676.	16.16	82.	72.	107.	3810.77	0.0112	1.21	0.0751	2049.42	0.0158
AVERAGE						6424.	15.45	85.	66.	112.	4209.67	0.0110	1.68	0.0869	1943.76	0.0169
STD. DEVIATION						1742.	0.38	6.	5.	7.	379.57	0.0012	0.41	0.0252	224.61	0.0027

20 RUNS ---- RECORDS 442 TO 757

RECORD TIRES	RUN	MAKE	SERVICE	LICENSE NO.	CAR NO.	MILES COMP	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID G/MILE	CO PER CENT	CO G/MILE	NOX PPM	NOX G/MILE
277	[illegible]	FORD	A.I.A.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
278	[illegible]	FORD	A.I.A.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
279	[illegible]	FORD	A.I.A.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
280	[illegible]	FORD	A.I.A.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.A.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 RUNS ... RECORDS 277 TO 296

RECORD IDRLS	RUN	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO AVG CONT	CO LB/MILE	NOX PPM	NOX LB/MILE
297	4407A	FORD	A.I.R.	31084	1	44067.	13.87	52.	77.	74.	3965.01	0.0101	1.60	0.1260	2095.44	0.0220
298	4407C	FORD	A.I.R.	31084	1	44076.	13.86	53.	79.	81.	2905.82	0.0102	1.59	0.1095	2257.74	0.0214
299	4403B	FORD	A.I.R.	31025	2	40567.	13.60	50.	65.	79.	4353.80	0.0130	1.86	0.1110	2361.40	0.0220
300	4403C	FORD	A.I.R.	21025	2	40576.	13.91	51.	65.	78.	4350.53	0.0130	1.40	0.0097	2405.95	0.0240
301	4411C	FORD	A.I.R.	31065	3	53464.	13.93	50.	65.	72.	3425.26	0.0123	1.45	0.1049	2190.46	0.0252
302	44113	FORD	A.I.R.	31065	3	53827.	13.96	54.	65.	82.	3395.70	0.0125	1.42	0.1067	1967.40	0.0190
303	44123	FORD	A.I.R.	31077	4	44451.	13.75	72.	74.	86.	4092.05	0.0115	1.73	0.0982	2411.97	0.0225
304	4412C	FORD	A.I.R.	31077	4	44460.	13.79	56.	60.	95.	4005.10	0.0106	1.67	0.0876	2346.42	0.0200
305	44144	FORD	A.I.R.	31027	5	36268.	13.70	60.	52.	85.	3073.26	0.0101	1.81	0.1090	2250.90	0.0203
306	4414C	FORD	A.I.R.	31027	5	36297.	13.65	59.	72.	85.	3523.40	0.0106	1.59	0.0955	1995.30	0.0206
307	44158	FORD	A.I.R.	31025	6	37566.	13.75	61.	72.	69.	2982.25	0.0086	1.43	0.0811	2007.96	0.0200
308	4415C	FORD	A.I.R.	31025	6	37675.	13.60	63.	67.	82.	2890.15	0.0087	1.38	0.0833	1771.20	0.0176
309	44208	FORD	A.I.R.	30190	7	56685.	13.74	42.	43.	75.	3750.79	0.0091	1.75	0.0855	2604.89	0.0209
310	4420C	FORD	A.I.R.	72190	7	56690.	13.89	46.	38.	78.	3635.83	0.0111	1.58	0.0923	2509.40	0.0256
311	44235	FORD	A.I.R.	31190	8	36995.	13.07	57.	32.	86.	4240.36	0.0137	3.32	0.2276	1211.20	0.0129
312	4423C	FORD	A.I.R.	31190	8	36918.	13.24	51.	32.	82.	4180.29	0.0127	2.80	0.1786	1444.85	0.0148
313	44248	FORD	A.I.R.	31079	9	38004.	14.24	51.	32.	77.	3365.71	0.0086	1.32	0.0668	2787.85	0.0231
314	4424C	FORD	A.I.R.	31079	9	38033.	14.28	46.	38.	65.	3210.36	0.0087	1.36	0.0794	2632.40	0.0236
315	44298	FORD	A.I.R.	31194	10	41758.	13.53	47.	38.	84.	4093.78	0.0144	2.27	0.1429	1456.40	0.0156
316	4429C	FORD	A.I.R.	31139	10	41760.	13.66	48.	47.	57.	4286.40	0.0145	1.90	0.1087	2022.26	0.0200
AVERAGE						43605.	13.77	52.	56.	76.	3681.09	0.0112	1.75	0.1174	2117.26	0.0203
STD. DEVIATION						6574.	0.25	6.	15.	8.	535.10	0.0020	0.51	0.0359	423.50	0.0030

20 RUNS .... RECORDS 842 TO 1057

RECORD	[illegible]	MANF	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO MOL CONT	CO LB/MILE	NOX PPM	NOX LB/MILE
317	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
318	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
319	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
320	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
321	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
322	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
323	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
324	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
325	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
326	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
327	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
328	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
329	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
330	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
331	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
332	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
333	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
334	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
335	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
336	[illegible]	FORD	A.I.A.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 CARS --- [illegible]

RECORD	RUN	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	[illegible]	HC FID LB/MILE	CO MOL PER CENT	CO LB/MILE	NOX PPM	NOX LB/MILE
337	[illegible]	FORD	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
338	[illegible]	FORD	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
339	[illegible]	FORD	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
340	[illegible]	FORD	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
341	[illegible]	FORD	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
342	[illegible]	FORD	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
343	[illegible]	FORD	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
344	[illegible]	FORD	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
345	[illegible]	FORD	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
346	[illegible]	FORD	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
347	[illegible]	FORD	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
348	[illegible]	FORD	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
349	[illegible]	FORD	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
350	[illegible]	FORD	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
351	[illegible]	FORD	A.I.R.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
352	[illegible]	FORD	A.I.R.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
353	[illegible]	FORD	A.I.R.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
354	[illegible]	FORD	A.I.R.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
355	[illegible]	FORD	A.I.R.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
356	[illegible]	FORD	A.I.R.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 RUNS .... [illegible]

RECORD	RUN	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID GR/MILE	CO PER CENT	CO GR/MILE	NOX PPM	NOX GR/MILE
357	[illegible]	FORD	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
358	[illegible]	FORD	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
359	[illegible]	FORD	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
360	[illegible]	FORD	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
361	[illegible]	FORD	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
362	[illegible]	FORD	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
363	[illegible]	FORD	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
364	[illegible]	FORD	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
365	[illegible]	FORD	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
366	[illegible]	FORD	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
367	[illegible]	FORD	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
368	[illegible]	FORD	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
369	[illegible]	FORD	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
370	[illegible]	FORD	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
371	[illegible]	FORD	A.I.R.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
372	[illegible]	FORD	A.I.R.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
373	[illegible]	FORD	A.I.R.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
374	[illegible]	FORD	A.I.R.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
375	[illegible]	FORD	A.I.R.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
376	[illegible]	FORD	A.I.R.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 RUNS --- RECORDS [illegible]

RECORD RUN SERIES	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO MOL CONC	CO LB/MILE	NOX PPM	NOX LB/MILE
377 [illegible]	FORD	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
378 [illegible]	FORD	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
379 [illegible]	FORD	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
380 [illegible]	FORD	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
381 [illegible]	FORD	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
382 [illegible]	FORD	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
383 [illegible]	FORD	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
384 [illegible]	FORD	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
385 [illegible]	FORD	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
386 [illegible]	FORD	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
387 [illegible]	FORD	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
388 [illegible]	FORD	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
389 [illegible]	FORD	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
390 [illegible]	FORD	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
391 [illegible]	FORD	A.I.R.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
392 [illegible]	FORD	A.I.R.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
393 [illegible]	FORD	A.I.R.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
394 [illegible]	FORD	A.I.R.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
395 [illegible]	FORD	A.I.R.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
396 [illegible]	FORD	A.I.R.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 RUNS .... RECORDS [illegible]

[illegible]	[illegible]	MAKE	DEVICE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	FORD	A.I.R.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

RECORD DOPLS	RUN	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO PER CENT	CO LB/MILE	NOX PPM	NOX LB/MILE
417	[illegible]	FORD	A.I.R.	31829	1	11742.	14.27	52.	43.	76.	3886.83	0.0089	1.89	0.0441	2457.44	0.0179
418	[illegible]	FORD	A.I.R.	31821	1	12469.	14.34	76.	44.	77.	3694.24	0.0078	1.61	0.0446	2379.78	0.0167
419	[illegible]	FORD	A.I.R.	31824	2	9235.	14.32	61.	68.	80.	3294.85	0.0071	1.34	0.0432	1986.79	0.0142
420	[illegible]	FORD	A.I.R.	31824	2	9294.	14.32	86.	79.	100.	3342.23	0.0088	1.34	0.0438	1847.97	0.0129
421	[illegible]	FORD	A.I.R.	34832	3	9419.	13.74	65.	90.	89.	3856.59	0.0087	1.48	0.0376	1712.67	0.0126
422	[illegible]	FORD	A.I.R.	34832	3	9441.	13.69	73.	63.	91.	3935.88	0.0090	1.48	0.0477	1618.75	0.0120
423	[illegible]	FORD	A.I.R.	31825	4	11946.	13.40	57.	77.	83.	4214.76	0.0092	1.48	0.0490	1924.10	0.0140
424	[illegible]	FORD	A.I.R.	31825	4	12200.	13.96	83.	84.	83.	4065.44	0.0089	1.42	0.0433	1726.61	0.0127
425	[illegible]	FORD	A.I.R.	34826	5	8542.	14.07	72.	65.	87.	3856.53	0.0079	1.33	0.0528	2240.40	0.0164
426	[illegible]	FORD	A.I.R.	34826	5	8569.	14.03	77.	52.	88.	3689.24	0.0077	1.32	0.0538	2420.77	0.0180
427	[illegible]	FORD	A.I.R.	34831	6	10637.	14.62	57.	53.	81.	3657.63	0.0077	0.80	0.0353	2804.40	0.0206
428	[illegible]	FORD	A.I.R.	34831	6	10644.	14.56	61.	25.	91.	3485.41	0.0075	0.80	0.0382	2273.79	0.0162
429	[illegible]	FORD	A.I.R.	34829	7	9139.	14.24	65.	38.	93.	3898.59	0.0080	1.11	0.0398	2237.62	0.0158
430	[illegible]	FORD	A.I.R.	34829	7	9165.	14.47	67.	77.	96.	3700.63	0.0084	0.95	0.0322	2371.40	0.0168
431	[illegible]	FORD	A.I.R.	34829	8	11139.	14.02	58.	44.	82.	3340.43	0.0082	1.39	0.0507	1851.76	0.0135
432	[illegible]	FORD	A.I.R.	34829	8	11162.	14.13	65.	74.	85.	3495.25	0.0080	1.22	0.0423	1805.72	0.0125
433	[illegible]	FORD	A.I.R.	34832	9	8667.	14.36	58.	46.	94.	3701.11	0.0087	1.81	0.0453	2005.72	0.0096
434	[illegible]	FORD	A.I.R.	34830	9	8682.	14.22	66.	32.	94.	3642.07	0.0086	1.76	0.0488	1798.49	0.0130
435	[illegible]	FORD	A.I.R.	34827	10	10267.	13.93	36.	41.	72.	4085.42	0.0091	1.46	0.0425	1722.33	0.0132
436	[illegible]	FORD	A.I.R.	34827	10	10274.	13.95	35.	41.	74.	4025.80	0.0090	1.43	0.0471	2246.40	0.0167
AVERAGE						9725.	14.21	62.	55.	85.	3746.42	0.0078	1.26	0.0439	2025.22	0.0148
STD. DEVIATION						2884.	0.26	12.	21.	7.	262.60	0.0011	0.27	0.0040	271.55	0.0022

20 RUNS --- RECORDS [illegible] TO [illegible]

RECORD CODES	RUN	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES ODOM	A/F	AMB. TEMP	HUMIDITY PCT	CARB TEMP	HC FID PPMC	HC FID LB/MILE	CO PER CENT	CO LB/MILE	NOX PPM	NOX LB/MILE
437	[illegible]	FORD	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
438	[illegible]	FORD	A.I.R.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
439	[illegible]	FORD	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
440	[illegible]	FORD	A.I.R.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
441	[illegible]	FORD	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
442	[illegible]	FORD	A.I.R.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
443	[illegible]	FORD	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
444	[illegible]	FORD	A.I.R.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
445	[illegible]	FORD	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
446	[illegible]	FORD	A.I.R.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
447	[illegible]	FORD	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
448	[illegible]	FORD	A.I.R.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
449	[illegible]	FORD	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
450	[illegible]	FORD	A.I.R.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
451	[illegible]	FORD	A.I.R.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
452	[illegible]	FORD	A.I.R.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
453	[illegible]	FORD	A.I.R.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
454	[illegible]	FORD	A.I.R.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
455	[illegible]	FORD	A.I.R.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
456	[illegible]	FORD	A.I.R.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 RUNS --- RECORDS [illegible] TO [illegible]

RECORD INDEX	RUN	MAKE	DEVICE	LICENSE NO.	CAR NO.	MILES DRIV	A/F	AMB. TEMP	HUMID PCT	CARB TEMP	HC FID PPMC	HC FID GM/MILE	CO PER CENT	CO GM/MILE	NOX PPM	NOX GM/MILE
517	[illegible]	PLYM	C.A.P.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
518	[illegible]	PLYM	C.A.P.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
519	[illegible]	PLYM	C.A.P.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
520	[illegible]	PLYM	C.A.P.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
521	[illegible]	PLYM	C.A.P.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
522	[illegible]	PLYM	C.A.P.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
523	[illegible]	PLYM	C.A.P.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
524	[illegible]	PLYM	C.A.P.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
525	[illegible]	PLYM	C.A.P.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
526	[illegible]	PLYM	C.A.P.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
527	[illegible]	PLYM	C.A.P.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
528	[illegible]	PLYM	C.A.P.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
529	[illegible]	PLYM	C.A.P.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
530	[illegible]	PLYM	C.A.P.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
531	[illegible]	PLYM	C.A.P.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
532	[illegible]	PLYM	C.A.P.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
533	[illegible]	PLYM	C.A.P.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
534	[illegible]	PLYM	C.A.P.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
535	[illegible]	PLYM	C.A.P.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
536	[illegible]	PLYM	C.A.P.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 RUNS --- RECORDS 517 TO 536

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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557	[illegible]	[illegible]	C.A.P.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
558	[illegible]	[illegible]	C.A.P.	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
559	[illegible]	[illegible]	C.A.P.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
560	[illegible]	[illegible]	C.A.P.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
561	[illegible]	[illegible]	C.A.P.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
562	[illegible]	[illegible]	C.A.P.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
563	[illegible]	[illegible]	C.A.P.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
564	[illegible]	[illegible]	C.A.P.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
565	[illegible]	[illegible]	C.A.P.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
566	[illegible]	[illegible]	C.A.P.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
567	[illegible]	[illegible]	C.A.P.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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569	[illegible]	[illegible]	C.A.P.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
570	[illegible]	[illegible]	C.A.P.	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
571	[illegible]	[illegible]	C.A.P.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
572	[illegible]	[illegible]	C.A.P.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
573	[illegible]	[illegible]	C.A.P.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
574	[illegible]	[illegible]	C.A.P.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
575	[illegible]	[illegible]	C.A.P.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
576	[illegible]	[illegible]	C.A.P.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

20 RUNS — RECORDS 557 TO 576

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[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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AVERAGE						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
STD. DEVIATION						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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AVERAGES						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	C.A.P.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

APPENDIX I

TABLE 1 a -- FULL DATA SET

(MEANS AND STANDARD DEVIATIONS)

```
CHEV,FORD,PLYM DEV.                    716 DATA POINTS ... 40 INPUT VARIABLES

 VAR                                 AVERAGE                STD. DEV.
  1   HOUSTON                       -0.00279330               0.81763291
  2   PHOENIX                       -0.00279330               0.81763291
  3   CHEVROLET                     -0.00558659               0.81590611
  4   FORD                           0.0                      0.81934669
  5   HOUS X CHEV                   -0.00279330               0.66689386
  6   HOUS X FORD                    0.0                      0.66899359
  7   PHOE X CHEV                   -0.00279330               0.66689386
  8   PHOE X FORD                    0.0                      0.66899359
  9   ODOM. MILES                    1.66319515               1.58286817
 10   A/F RATIO                     13.97546577               0.52954650
 11   AMBIENT TEMP                  68.25418091              14.31166958
 12   PCT HUMID                     49.77374268              24.69244385
 13   CARB. TEMP.                   92.88781738              16.73825073
 14   CE HC FID                   3575.93139648            1124.07202148
 15   CW HC FID                      0.00860577               0.00319850
 16   CE CO                          1.58103561               0.77133501
 17   CW CO                          0.07809126               0.04437759
 18   CE NOX                      1920.17724609             572.69702148
 19   CW NOX                         0.01523686               0.00514186
 20   AMBIENT PR.                   29.43807983               0.62340701
 21   A/F DIF RICH                  -0.27550733               0.34479380
 22   A/F DIF LEAN                   0.12216359               0.27991196
 23   CE HC IR                    1899.17724609             730.65112305
 24   CW HC IR                       0.00453826               0.00186769
 25   CE CO2                        13.31977749               0.36939275
 26   CW CO2                         1.01406765               0.15727806
 27   UE O2                          4.99322605               2.51995616
 28   SCF EX                        83.92666626              16.87409973
 29   C MPG                         16.97766113               2.99128914
 30   LOG MILES                      3.98822403               0.49479920
 31   LOG CE HC FI                   3.53842926               0.10533720
 32   LOG CW HC FI                  -2.08676147               0.13123250
 33   LOG CE HC IR                   3.25988388               0.11500698
 34   LOG CW HC IR                  -2.36530695               0.13049150
 35   LOG CE NOX                     3.26229191               0.13863564
 36   LOG CW NOX                    -1.84171486               0.15217477
 37   LOG CE CO                      0.15628529               0.19019696
 38   LOG CW CO                     -1.16330814               0.21654099
 39   LOG CE CO2                     1.12429428               0.01546023
 40   LOG CW CO2                     0.00090018               0.06765401
```

```
                          TABLE 2a -- FULL DATA SRV
         Cities, car makes, interactions without miles as covariate.

DVAR                         SE DVAR      SD DVAR        R DVAR   R-SQUARED
 14  CE HC FID          1018.25292969  1124.07202       0.43428     0.19

IVAR                       COEFFICIENT    SD COEFF          T
  0                     3572.45849609    38.05598      93.87375
  1   HOUSTON            102.18169908    53.85741       1.89726
  2   PHOENIX           -228.89561462    53.85742      -4.25003
  3   CHEVROLET         -613.69848633    53.97157     -11.37077
  4   FORD               168.29530334    53.74303       3.13148
  5   HOUS X CHEV         26.85241699    76.43476       0.35131
  6   HOUS X FORD         70.00619507    76.03107       0.92076
  7   PHOE X CHEV         84.23171997    76.43468       1.10201
  8   PHOE X FORD         30.58460999    76.03107       0.40226

DVAR                         SE DVAR      SD DVAR        R DVAR   R-SQUARED
 15  CW HC FID             0.00283720     0.00320       0.47112     0.22

IVAR                       COEFFICIENT    SD COEFF          T
  0                        0.00859927     0.00011      81.09683
  1   HOUSTON              0.00130662     0.00015       8.70703
  2   PHOENIX             -0.00078619     0.00015      -5.23899
  3   CHEVROLET           -0.00151041     0.00015     -10.04379
  4   FORD                 0.00041131     0.00015       2.74673
  5   HOUS X CHEV          0.00005360     0.00021       0.25168
  6   HOUS X FORD          0.00041661     0.00021       1.96655
  7   PHOE X CHEV          0.00012488     0.00021       0.58636
  8   PHOE X FORD          0.00021174     0.00021       0.99949

DVAR                         SE DVAR      SD DVAR        R DVAR   R-SQUARED
 16  CE CO                 0.73680460     0.77134       0.31263     0.10

IVAR                       COEFFICIENT    SD COEFF          T
  0                        1.58054161     0.02754      57.39661
  1   HOUSTON              0.08935958     0.03897       2.29297
  2   PHOENIX             -0.05277600     0.03897      -1.35423
  3   CHEVROLET           -0.16692114     0.03905      -4.27415
  4   FORD                -0.12801474     0.03889      -3.29166
  5   HOUS X CHEV          0.00409904     0.05531       0.07411
  6   HOUS X FORD         -0.06900000     0.05502      -1.18148
  7   PHOE X CHEV          0.11755502     0.05531       2.12547
  8   PHOE X FORD          0.06694948     0.05502       1.20966

DVAR                         SE DVAR      SD DVAR        R DVAR   R-SQUARED
 17  CW CO                 0.04178555     0.04438       0.35118     0.12

IVAR                       COEFFICIENT    SD COEFF          T
  0                        0.07808578     0.00156      50.00098
  1   HOUSTON              0.01387799     0.00221       6.27911
  2   PHOENIX             -0.00568261     0.00221      -2.57118
  3   CHEVROLET           -0.00790236     0.00221      -3.56797
  4   FORD                -0.00709414     0.00221      -3.21067
  5   HOUS X CHEV          0.00125409     0.00314       0.39982
  6   HOUS X FORD         -0.00244808     0.00312      -0.78463
  7   PHOE X CHEV          0.00451595     0.00314       1.43975
  8   PHOE X FORD          0.00558243     0.00312       1.78921
```

TABLE 26 -- FULL DATA SET

Cities, car makes, interactions without miles as covariate.

```
DVAR                              SE DVAR        SD DVAR          R DVAR   R-SQUARED
 18   CE NOX                 453.94799805      572.69702         0.61562     0.38

IVAR                          COEFFICIENT       SD COEFF             T
  0                         1917.62084961       16.96576       113.02887
  1   HOUSTON                 33.00854492       24.01019         1.37477
  2   PHOENIX                 55.41539950       24.01021         2.30799
  3   CHEVROLET             -422.16137695       24.06110       -17.54538
  4   FORD                   116.52456055       23.95921         4.86338
  5   HOUS X CHEV           -147.61096191       34.07962        -4.33136
  6   HOUS X FORD            168.84509277       33.89546         4.98135
  7   PHOE X CHEV            -11.24221802       34.07539        -0.32992
  8   PHOE X FORD           -223.23193250       33.89546        -6.58595

DVAR                              SE DVAR        SD DVAR          R DVAR   R-SQUARED
 19   CM NOX                   0.00392673        0.00514         0.65063     0.42

IVAR                          COEFFICIENT       SD COEFF             T
  0                            0.01523890        0.00015       103.83768
  1   HOUSTON                  0.00207517        0.00021         9.99157
  2   PHOENIX                  0.00008069        0.00021         0.38830
  3   CHEVROLET               -0.00348095        0.00021       -16.72466
  4   FORD                     0.00105890        0.00021         5.10926
  5   HOUS X CHEV             -0.00141931        0.00029        -4.88300
  6   HOUS X FORD              0.00194479        0.00029         6.63295
  7   PHOE X CHEV             -0.00017626        0.00029        -0.59799
  8   PHOE X FORD             -0.00161848        0.00029        -5.52003

DVAR                              SE DVAR        SD DVAR          R DVAR   R-SQUARED
 23   CE HC IR               689.16406250      730.65112         0.34681     0.12

IVAR                          COEFFICIENT       SD COEFF             T
  0                         1897.61918945       25.75568        73.66705
  1   HOUSTON         26.[illegible]983637       36.45125         0.71904
  2   PHOENIX               -215.91976929       36.45125        -5.92352
  3   CHEVROLET             -246.25141907       36.52852        -6.74135
  4   FORD                   190.62760925       36.37364         5.24079
  5   HOUS X CHEV            -15.48782063       51.73181        -0.29939
  6   HOUS X FORD             61.80097961       51.45862         1.20098
  7   PHOE X CHEV             68.76696777       51.73178         1.32930
  8   PHOE X FORD            -14.94326210       51.45862        -0.29039

DVAR                              SE DVAR        SD DVAR          R DVAR   R-SQUARED
 24   CM HC IR                 0.00172813        0.00187         0.39172     0.15

IVAR                          COEFFICIENT       SD COEFF             T
  0                            0.00453500        0.00006        70.21539
  1   HOUSTON                  0.00062892        0.00009         6.88066
  2   PHOENIX                 -0.00061017        0.00009        -6.67549
  3   CHEVROLET               -0.00063827        0.00009        -6.98820
  4   FORD                     0.00047799        0.00009         5.24090
  5   HOUS X CHEV             -0.00005140        0.00013        -0.39622
  6   HOUS X FORD              0.00031996        0.00013         2.47959
  7   PHOE X CHEV              0.00014427        0.00013         1.11214
  8   PHOE X FORD              0.00001379        0.00013         0.10688
```

TABLE 5e -- FULL DATA SET

Cities, car makes, interactions without miles as covariate.

```
DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 25  CE CO2                    0.34904330     0.36939       0.37048      0.14

IVAR                          COEFFICIENT     SD COEFF         T
  0                           13.31996918     0.01290    1032.90942
  1  HOUSTON                  -0.02280675     0.01825      -1.24968
  2  PHOENIX                   0.09032631     0.01825       4.94938
  3  CHEVROLET                 0.04309285     0.01829       2.35625
  4  FORD                      0.06133189     0.01821       3.36780
  5  HOUS X CHEV              -0.01305938     0.02590      -0.50421
  6  HOUS X FORD              -0.00299030     0.02576      -0.11607
  7  PHOE X CHEV              -0.06979692     0.02590      -2.69481
  8  PHOE X FORD              -0.08368198     0.02576      -3.24804

DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 26  CW CO2                    0.12932479     0.15728       0.61001      0.37

IVAR                          COEFFICIENT     SD COEFF         T
  0                            1.01432323     0.00468     216.94834
  1  HOUSTON                   0.12212700     0.00663      18.42331
  2  PHOENIX                  -0.01971332     0.00663      -2.97383
  3  CHEVROLET                -0.00033200     0.00664      -0.04998
  4  FORD                      0.01037491     0.00661       1.56842
  5  HOUS X CHEV               0.01639598     0.00941       1.74276
  6  HOUS X FORD               0.01997225     0.00936       2.13421
  7  PHOE X CHEV              -0.02500957     0.00941      -2.65838
  8  PHOE X FORD               0.01390006     0.00936       1.48534

DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 31  LOG CS HC FI              0.08983195     0.10534       0.52997      0.28

IVAR                          COEFFICIENT     SD COEFF         T
  0                            3.53800201     0.00336    1053.80396
  1  HOUSTON                   0.01194735     0.00475       2.51450
  2  PHOENIX                  -0.02193496     0.00475      -4.61654
  3  CHEVROLET                -0.07366717     0.00476     -15.47155
  4  FORD                      0.02225187     0.00474       4.69320
  5  HOUS X CHEV               0.00216705     0.00674       0.32137
  6  HOUS X FORD               0.00562278     0.00671       0.83827
  7  PHOE X CHEV               0.00375073     0.00674       0.55623
  8  PHOE X FORD               0.00024721     0.00671       0.03686

DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 32  LOG CW HC FI              0.10984325     0.13123       0.55430      0.31

IVAR                          COEFFICIENT     SD COEFF         T
  0                           -2.08707714     0.00411    -508.39111
  1  HOUSTON                   0.06372154     0.00581      10.96789
  2  PHOENIX                  -0.03070869     0.00581      -5.28561
  3  CHEVROLET                -0.07575005     0.00582     -13.01069
  4  FORD                      0.02359613     0.00580       4.07006
  5  HOUS X CHEV               0.00832012     0.00825       1.00907
  6  HOUS X FORD               0.01396855     0.00820       1.70310
  7  PHOE X CHEV              -0.00470387     0.00825      -0.57049
  8  PHOE X FORD               0.01026836     0.00820       1.25197
```

TABLE 24 -- FULL DATA SET

Cities, car makes, interactions without miles as covariate.

```
DVAR                                SE DVAR      SD DVAR        R DVAR    R-SQUARED
 33  LOG CE HC IR                  0.10385299    0.11501       0.44010      0.19

IVAR                              COEFFICIENT    SD COEFF         T
  0                                3.25950527    0.00388     839.77954
  1  HOUSTON                       0.00964994    0.00549       1.75677
  2  PHOENIX                      -0.04300322    0.00549      -7.82875
  3  )HEVROLET                    -0.05264614    0.00550      -9.56397
  4  FORD                          0.04003982    0.00548       7.30477
  5  HOUS X CHEV                  -0.00495321    0.00780      -0.63564
  6  HOUS X FORD                   0.00899186    0.00775       1.15956
  7  PHOE X CHEV                   0.00970801    0.00780       1.24531
  8  PHOE X FORD                  -0.00516495    0.00775      -0.66606

DVAR                                SE DVAR      SD DVAR        R DVAR    R-SQUARED
 34  LOG CW HC IR                  0.11475354    0.13049       0.48510      0.24

IVAR                              COEFFICIENT    SD COEFF         T
  0                               -2.36557198    0.00429    -551.57300
  1  HOUSTON                       0.06141676    0.00607      10.11885
  2  PHOENIX                      -0.05177734    0.00607      -8.53068
  3  CHEVROLET                    -0.05472976    0.00608      -8.99804
  4  FORD                          0.04138443    0.00606       6.83289
  5  HOUS X CHEV                   0.00119787    0.00861       0.13906
  6  HOUS X FORD                   0.01733846    0.00857       2.02353
  7  PHOE X CHEV                   0.00125680    0.00861       0.14590
  8  PHOE X FORD                   0.00485377    0.00857       0.56647

DVAR                                SE DVAR      SD DVAR        R DVAR    R-SQUARED
 35  LOG CE NOX                    0.11206287    0.13864       0.59491      0.35

IVAR                              COEFFICIENT    SD COEFF         T
  0                                3.26166153    0.00419     778.77148
  1  HOUSTON                       0.00053716    0.00593       0.09063
  2  PHOENIX                       0.01653627    0.00593       2.78980
  3  CHEVROLET                    -0.10094166    0.00594     -16.99414
  4  FORD                          0.03751919    0.00591       6.35345
  5  HOUS X CHEV                  -0.03870910    0.00841      -4.60168
  6  HOUS X FORD                   0.04306218    0.00837       5.14634
  7  PHOE X CHEV                  -0.00059133    0.00841      -0.07030
  8  PHOE X FORD                  -0.05235711    0.00837      -6.25718

DVAR                                SE DVAR      SD DVAR        R DVAR    R-SQUARED
 36  LOG CW NOX                    0.12036055    0.15217       0.61759      0.38

IVAR                              COEFFICIENT    SD COEFF         T
  0                               -1.84223557    0.00455    -404.53769
  1  HOUSTON                       0.05230436    0.00637       8.21607
  2  PHOENIX                       0.00776185    0.00637       1.21976
  3  CHEVROLET                    -0.10303193    0.00638     -16.15021
  4  FORD                          0.03885766    0.00635       6.11682
  5  HOUS X CHEV                  -0.03256060    0.00903      -3.60388
  6  HOUS X FORD                   0.05141514    0.00899       5.72099
  7  PHOE X CHEV                  -0.00904105    0.00903      -1.00069
  8  PHOE X FORD                  -0.04234418    0.00899      -4.71166
```

TABLE 2e -- FULL DATA SET

Cities, car makes, interactions without miles as covariate.

```
DVAR                               SE DVAR        SD DVAR        R DVAR    R-SQUARED
 37  LOG CE CO                    0.18720871      0.19019       0.20493      0.04

IVAR                             COEFFICIENT     SD COEFF          T
  0                               0.15625769      0.00700      22.33304
  1  HOUSTON                      0.01684708      0.00990       1.70141
  2  PHOENIX                      0.01173378      0.00990       1.18501
  3  CHEVROLET                   -0.03051949      0.00992      -3.07568
  4  FORD                        -0.00975696      0.00988      -0.98726
  5  HOUS X CHEV                  0.00469167      0.01405       0.33386
  6  HOUS X FORD                 -0.01656879      0.01398      -1.18530
  7  PHOE X CHEV                  0.01797203      0.01405       1.27890
  8  PHOE X FORD                 -0.00427684      0.01398      -0.30596

DVAR                               SE DVAR        SD DVAR        R DVAR    R-SQUARED
 38  LOG CW CO                    0.20731616      0.21654       0.30601      0.09

IVAR                             COEFFICIENT     SD COEFF          T
  0                              -1.16323040      0.00775    -150.12929
  1  HOUSTON                      0.06860781      0.01097       6.25678
  2  PHOENIX                      0.00295622      0.01097       0.26960
  3  CHEVROLET                   -0.03268170      0.01099      -2.97614
  4  FORD                        -0.00849240      0.01094      -0.77612
  5  HOUS X CHEV                  0.01084805      0.01556       0.69708
  6  HOUS X FORD                 -0.00822636      0.01548      -0.53142
  7  PHOE X CHEV                  0.00952062      0.01556       0.61178
  8  PHOE X FORD                  0.00574296      0.01548       0.37099

DVAR                               SE DVAR        SD DVAR        R DVAR    R-SQUARED
 39  LOG CE CO2                   0.01481710      0.01546       0.30289      0.09

IVAR                             COEFFICIENT     SD COEFF          T
  0                               1.12429905      0.00055    2030.25757
  1  HOUSTON                     -0.00077369      0.00078      -0.98722
  2  PHOENIX                      0.00305291      0.00078       3.89567
  3  CHEVROLET                    0.00152543      0.00079       1.94231
  4  FORD                         0.00212728      0.00078       2.72016
  5  HOUS X CHEV                 -0.00041902      0.00111      -0.37675
  6  HOUS X FORD                 -0.00007813      0.00111      -0.07062
  7  PHOE X CHEV                 -0.00237749      0.00111      -2.13757
  8  PHOE X FORD                 -0.00283463      0.00111      -2.56211

DVAR                               SE DVAR        SD DVAR        R DVAR    R-SQUARED
 40  LOG CW CO2                   0.05428448      0.06765       0.60281      0.36

IVAR                             COEFFICIENT     SD COEFF          T
  0                               0.00100899      0.00203       0.49733
  1  HOUSTON                      0.05098454      0.00287      17.75714
  2  PHOENIX                     -0.00572347      0.00287      -1.99409
  3  CHEVROLET                   -0.00064139      0.00288      -0.22291
  4  FORD                         0.00338315      0.00287       1.18081
  5  HOUS X CHEV                  0.00573593      0.00407       1.40765
  6  HOUS X FORD                  0.00826629      0.00405       2.03939
  7  PHOE X CHEV                 -0.01082022      0.00407      -2.65736
  8  PHOE X FORD                  0.00718431      0.00405       1.77245
```

TABLE 3a -- FULL DATA SET

Cities, car makes, interactions and miles as covariate.

```
DVAR                          SE DVAR       SD DVAR          R DVAR   R-SQUARED
 14   CE HC FID          986.01220703  1124.07202         0.49015      0.24

IVAR                      COEFFICIENT     SD COEFF            T
  0                     3288.49951172    55.11966        59.66110
  1   HOUSTON             92.59185791    52.17050         1.77479
  2   PHOENIX           -206.39497375    52.25319        -3.94990
  3   CHEVROLET         -605.47363281    52.27317       -11.58288
  4   FORD               171.48336792    52.04161         3.29501
  5   HOUS X CHEV         48.35958862    74.07967         0.65281
  6   HOUS X FORD         59.41119385    73.63959         0.80678
  7   PHOE X CHEV         76.46342468    74.02307         1.03297
  8   PHOE X FORD         27.48652649    73.62508         0.37333
  9   ODOM. MILES        172.88273621    24.95590         6.92793

DVAR                          SE DVAR       SD DVAR          R DVAR   R-SQUARED
 15   CW HC FID            0.00262300     0.00322         0.57961      0.34

IVAR                      COEFFICIENT     SD COEFF            T
  0                        0.00739887     0.00015        50.45958
  1   HOUSTON              0.00126608     0.00014         9.12267
  2   PHOENIX             -0.00069107     0.00014        -4.97159
  3   CHEVROLET           -0.00147564     0.00014       -10.61116
  4   FORD                 0.00042479     0.00014         3.06827
  5   HOUS X CHEV          0.00014452     0.00020         0.73336
  6   HOUS X FORD          0.00037182     0.00020         1.89805
  7   PHOE X CHEV          0.00009204     0.00020         0.46761
  8   PHOE X FORD          0.00019864     0.00020         1.01423
  9   ODOM. MILES          0.00073084     0.00007        11.00864

DVAR                          SE DVAR       SD DVAR          R DVAR   R-SQUARED
 16   CE CO                0.65430897     0.77134         0.53803      0.29

IVAR                      COEFFICIENT     SD COEFF            T
  0                        1.20509815     0.03658        32.94696
  1   HOUSTON              0.07668018     0.03462         2.21492
  2   PHOENIX             -0.02302623     0.03467        -0.66406
  3   CHEVROLET           -0.15604663     0.03469        -4.49832
  4   FORD                -0.12379956     0.03454        -3.58470
  5   HOUS X CHEV          0.03253527     0.04916         0.66184
  6   HOUS X FORD         -0.07900840     0.04887        -1.61682
  7   PHOE X CHEV          0.10728401     0.04912         2.18407
  8   PHOE X FORD          0.06245320     0.04886         1.27829
  9   ODOM. MILES          0.22858101     0.01656        13.80277

DVAR                          SE DVAR       SD DVAR          R DVAR   R-SQUARED
 17   CW CO                0.03559761     0.04438         0.60186      0.36

IVAR                      COEFFICIENT     SD COEFF            T
  0                        0.05385250     0.00199        27.06206
  1   HOUSTON              0.01305918     0.00188         6.93350
  2   PHOENIX             -0.00376239     0.00189        -1.99460
  3   CHEVROLET           -0.00720045     0.00189        -3.81520
  4   FORD                -0.00682207     0.00188        -3.63088
  5   HOUS X CHEV          0.00308951     0.00267         1.15519
  6   HOUS X FORD         -0.00335227     0.00266        -1.26092
  7   PHOE X CHEV          0.00385300     0.00267         1.44176
  8   PHOE X FORD          0.00531803     0.00266         2.00072
  9   ODOM. MILES          0.01475395     0.00090        16.37555
```

TABLE 3b -- FULL DATA SET

Cities, car makes, interactions and miles as covariate.

```
DVAR                          SE DVAR       SD DVAR       R DVAR   R-SQUARED
 18  CE NOX               454.09970312   572.69702      0.61580     0.38

IVAR                       COEFFICIENT    SD COEFF         T
  0                      1903.74023637    25.38466     74.99570
  1  HOUSTON               32.53976460    24.02667      1.35433
  2  PHOENIX               56.51522827    24.06454      2.34848
  3  CHEVROLET           -421.75927734    24.07513    -17.51849
  4  FORD                 116.58039856    23.96794      4.86401
  5  HOUS X CHEV         -146.55963135    34.11667     -4.29586
  6  HOUS X FORD          166.32717896    33.91379      4.90438
  7  PHOE X CHEV          -11.62194729    34.09061     -0.34092
  8  PHOE X FORD         -223.38536072    33.90710     -6.58816
  9  ODOM. MILES            8.45087528    11.49314      0.73530

DVAR                          SE DVAR       SD DVAR       R DVAR   R-SQUARED
 19  CW NOX                 0.00386750     0.00514      0.66436     0.44

IVAR                       COEFFICIENT    SD COEFF         T
  0                         0.01447085     0.00022     66.93285
  1  HOUSTON                0.00204924     0.00020     10.01426
  2  PHOENIX                0.00014151     0.00020      0.69063
  3  CHEVROLET             -0.00349871     0.00021    -16.86792
  4  FORD                   0.00106792     0.00020      5.22954
  5  HOUS X CHEV           -0.00138113     0.00029     -4.75323
  6  HOUS X FORD            0.00191613     0.00029      6.63386
  7  PHOE X CHEV           -0.00019727     0.00029     -0.67965
  8  PHOE X FORD           -0.00162686     0.00029     -5.63368
  9  ODOM. MILES            0.00046761     0.00010      4.77707

DVAR                          SE DVAR       SD DVAR       R DVAR   R-SQUARED
 23  CE HC IR             687.48608398   730.65112      0.35470     0.13

IVAR                       COEFFICIENT    SD COEFF         T
  0                      1837.09326172    38.43156     47.80167
  1  HOUSTON               24.17253113    36.37551      0.66453
  2  PHOENIX             -211.13960266    36.43295     -5.79529
  3  CHEVROLET           -244.50410461    36.44897     -6.70812
  4  FORD                 191.30488586    36.28670      5.27205
  5  HOUS X CHEV          -10.91871834    51.65121     -0.21139
  6  HOUS X FORD           59.55010986    51.34439      1.15982
  7  PHOE X CHEV           67.11662292    51.61176      1.30041
  8  PHOE X FORD          -15.60143566    51.53426     -0.30392
  9  ODOM. MILES           36.72814941    17.40022      2.11079

DVAR                          SE DVAR       SD DVAR       R DVAR   R-SQUARED
 24  CW HC IR               0.00169505     0.00187      0.43208     0.19

IVAR                       COEFFICIENT    SD COEFF         T
  0                         0.00415635     0.00009     43.96615
  1  HOUSTON                0.00061619     0.00009      6.86990
  2  PHOENIX               -0.00058017     0.00009     -6.45864
  3  CHEVROLET             -0.00062731     0.00009     -6.98035
  4  FORD                   0.00048224     0.00009      5.39009
  5  HOUS X CHEV           -0.00002272     0.00013     -0.17863
  6  HOUS X FORD            0.00030583     0.00013      2.41586
  7  PHOE X CHEV            0.00013391     0.00013      1.05232
  8  PHOE X FORD            0.00000966     0.00013      0.07633
  9  ODOM. MILES            0.00023051     0.00004      5.17291
```

TABLE 3c -- FULL DATA OFF

Cities, car makes, interactions and miles as covariate

```
DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 25  CE CO2                     0.32688958     0.36939        0.47619     0.23

IVAR                          COEFFICIENT      SD COEFF          T
  0                             13.44281769    0.01827      735.64844
  1  HOUSTON                    -0.01865793    0.01730       -1.07876
  2  PHOENIX                     0.08059186    0.01732        4.65227
  3  CHEVROLET                   0.03953461    0.01733        2.28118
  4  FORD                        0.05995264    0.01725        3.47479
  5  HOUS X CHEV                -0.02236400    0.02456       -0.91062
  6  HOUS X FORD                 0.00159340    0.02441        0.06527
  7  PHOE X CHEV                -0.06643611    0.02454       -2.70722
  8  PHOE X FORD                -0.08234125    0.02441       -3.37348
  9  ODOM. MILES                -0.07479399    0.00827       -9.04024

DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 26  CW CO2                     0.11789984     0.15720        0.66746     0.45

IVAR                          COEFFICIENT      SD COEFF          T
  0                              0.96695650    0.00659      146.76312
  1  HOUSTON                     0.12052733    0.00624       19.32795
  2  PHOENIX                    -0.01596002    0.00625       -2.55527
  3  CHEVROLET                   0.00103995    0.00625        0.16643
  4  FORD                        0.01090670    0.00622        1.75325
  5  HOUS X CHEV                 0.01998316    0.00885        2.25674
  6  HOUS X FORD                 0.01820491    0.00880        2.06821
  7  PHOE X CHEV                -0.02630538    0.00885       -2.97299
  8  PHOE X FORD                 0.01338327    0.00880        1.52073
  9  ODOM. MILES                 0.02883831    0.00298        9.66747

DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 31  LOG CE HC FI               0.08545023     0.10536        0.59180     0.35

IVAR                          COEFFICIENT      SD COEFF          T
  0                              3.50716305    0.00478      734.20728
  1  HOUSTON                     0.01090587    0.00452        2.41215
  2  PHOENIX                    -0.01949133    0.00453       -4.30425
  3  CHEVROLET                  -0.07277393    0.00453      -16.06354
  4  FORD                        0.02259810    0.00451        5.01043
  5  HOUS X CHEV                 0.00450279    0.00642        0.70138
  6  HOUS X FORD                 0.00447214    0.00638        0.70077
  7  PHOE X CHEV                 0.00290708    0.00642        0.45317
  8  PHOE X FORD                -0.00008925    0.00638       -0.01399
  9  ODOM. MILES                 0.01877552    0.00216        8.68136

DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 32  LOG CW HC FI               0.09882212     0.13123        0.66339     0.44

IVAR                          COEFFICIENT      SD COEFF          T
  0                             -2.15024353    0.00552     -387.42261
  1  HOUSTON                     0.06192599    0.00523       11.84350
  2  PHOENIX                    -0.02649557    0.00524       -5.05928
  3  CHEVROLET                  -0.07421005    0.00524      -14.16606
  4  FORD                        0.02419305    0.00522        4.63024
  5  HOUS X CHEV                 0.01236703    0.00742        1.66300
  6  HOUS X FORD                 0.01198560    0.00738        1.62386
  7  PHOE X CHEV                -0.00615837    0.00742       -0.83009
  8  PHOE X FORD                 0.00968829    0.00738        1.31295
  9  ODOM. MILES                 0.03236982    0.00250       12.94181
```

TABLE 34 -- FULL DATA SET

Cities, car makes, interactions and miles as covariate.

```
DVAR                                SE DVAR       SD DVAR        R DVAR    R-SQUARED
 33  LOG CE HC IR                  0.10339385    0.11501       0.44937     0.20

IVAR                              COEFFICIENT    SD COEFF          T
  0                                3.24789715    0.00578     561.93164
  1  HOUSTON                       0.00925792    0.00547       1.69230
  2  PHOENIX                      -0.04208343    0.00548      -7.68044
  3  CHEVROLET                    -0.05230992    0.00548      -9.54263
  4  FORD                          0.04017014    0.00546       7.36000
  5  HOUS X CHEV                  -0.00407603    0.00777      -0.52472
  6  HOUS X FORD                   0.00855875    0.00772       1.10837
  7  PHOE X CHEV                   0.00939045    0.00776       1.20978
  8  PHOE X FORD                  -0.00529159    0.00772      -0.68541
  9  ODOM. MILES                   0.00706715    0.00262       2.70059

DVAR                                SE DVAR       SD DVAR        R DVAR    R-SQUARED
 34  LOG CW HC IR                  0.11065048    0.13049       0.53854     0.29

IVAR                              COEFFICIENT    SD COEFF          T
  0                               -2.39949989    0.00619    -387.92090
  1  HOUSTON                       0.06027093    0.00585      10.29466
  2  PHOENIX                      -0.04908885    0.00586      -8.37142
  3  CHEVROLET                    -0.05374704    0.00587      -9.16178
  4  FORD                          0.04176535    0.00584       7.15121
  5  HOUS X CHEV                   0.00376765    0.00831       0.45321
  6  HOUS X FORD                   0.01607252    0.00826       1.94492
  7  PHOE X CHEV                   0.00032861    0.00831       0.03956
  8  PHOE X FORD                   0.00448360    0.00826       0.54266
  9  ODOM. MILES                   0.02065684    0.00280       7.37598

DVAR                                SE DVAR       SD DVAR        R DVAR    R-SQUARED
 35  LOG CE NOX                    0.11212438    0.13864       0.59508     0.35

IVAR                              COEFFICIENT    SD COEFF          T
  0                                3.25945377    0.00627     520.02051
  1  HOUSTON                       0.00046263    0.00593       0.07798
  2  PHOENIX                       0.01671116    0.00594       2.81239
  3  CHEVROLET                    -0.10087770    0.00594     -16.96968
  4  FORD                          0.03756397    0.00592       6.34391
  5  HOUS X CHEV                  -0.03854194    0.00842      -4.57527
  6  HOUS X FORD                   0.04297983    0.00837       5.13258
  7  PHOE X CHEV                  -0.00065171    0.00842      -0.07742
  8  PHOE X FORD                  -0.05238118    0.00837      -6.25651
  9  ODOM. MILES                   0.00134367    0.00284       0.47348

DVAR                                SE DVAR       SD DVAR        R DVAR    R-SQUARED
 36  LOG CW NOX                    0.11837512    0.15217       0.63443     0.40

IVAR                              COEFFICIENT    SD COEFF          T
  0                               -1.86679850    0.00662    -282.10620
  1  HOUSTON                       0.05147582    0.00626       8.21858
  2  PHOENIX                       0.00970821    0.00627       1.54756
  3  CHEVROLET                    -0.10232043    0.00628     -16.30368
  4  FORD                          0.03913341    0.00625       6.26331
  5  HOUS X CHEV                  -0.03069996    0.00889      -3.45192
  6  HOUS X FORD                   0.05069866    0.00886       5.71202
  7  PHOE X CHEV                  -0.00971303    0.00889      -1.09297
  8  PHOE X FORD                  -0.04261217    0.00885      -4.82092
  9  ODOM. MILES                   0.01495485    0.00300       4.99149
```

```
                         TABLE 3e -- FULL DATA SET
          Cities, car makes, interactions and miles as covariate.

DVAR
 37  LOG CE CO               SE DVAR        SD DVAR        R DVAR    R-SQUARED
                            0.16364664      0.19019       0.51866      0.27

IVAR                       COEFFICIENT     SD COEFF          T
  0                         0.05592554      0.00915       6.06962
  1  HOUSTON                0.01344517      0.00866       1.55280
  2  PHOENIX                0.01971570      0.00867       2.27339
  3  CHEVROLET             -0.02760184      0.00868      -3.18134
  4  FORD                  -0.00862402      0.00866      -0.99843
  5  HOUS X CHEV            0.01232117      0.01229       1.00216
  6  HOUS X FORD           -0.02032727      0.01222      -1.66319
  7  PHOE X CHEV            0.01521630      0.01229       1.23856
  8  PHOE X FORD           -0.00537586      0.01222      -0.43994
  9  ODOM. MILES            0.06132876      0.00414      14.80696

DVAR
 38  LOG CW CO               SE DVAR        SD DVAR        R DVAR    R-SQUARED
                            0.17481500      0.21654       0.59704      0.36

IVAR                       COEFFICIENT     SD COEFF          T
  0                        -1.28663063      0.00977    -131.65916
  1  HOUSTON                0.06444037      0.00925       6.96685
  2  PHOENIX                0.01273432      0.00926       1.37457
  3  CHEVROLET             -0.02910749      0.00927      -3.14054
  4  FORD                  -0.00710696      0.00923      -0.77023
  5  HOUS X CHEV            0.02019442      0.01313       1.53757
  6  HOUS X FORD           -0.01283062      0.01306      -0.98276
  7  PHOE X CHEV            0.00614475      0.01312       0.46821
  8  PHOE X FORD            0.00439661      0.01305       0.33682
  9  ODOM. MILES            0.07512957      0.00442      16.98013

DVAR
 39  LOG CE CO2              SE DVAR        SD DVAR        R DVAR    R-SQUARED
                            0.01436902      0.01546       0.38348      0.15

IVAR                       COEFFICIENT     SD COEFF          T
  0                         1.12834072      0.00080    1404.71777
  1  HOUSTON               -0.00063719      0.00076      -0.83811
  2  PHOENIX                0.00271264      0.00076       3.58860
  3  CHEVROLET              0.00140836      0.00076       1.84070
  4  FORD                   0.00208190      0.00076       2.74505
  5  HOUS X CHEV           -0.00072515      0.00108      -0.67171
  6  HOUS X FORD            0.00007268      0.00107       0.06772
  7  PHOE X CHEV           -0.00226692      0.00108      -2.10157
  8  PHOE X FORD           -0.00279054      0.00107      -2.60086
  9  ODOM. MILES           -0.00246074      0.00036      -6.76625

DVAR
 40  LOG CW CO2              SE DVAR        SD DVAR        R DVAR    R-SQUARED
                            0.05163482      0.06765       0.65179      0.42

IVAR                       COEFFICIENT     SD COEFF          T
  0                        -0.01763275      0.00289      -6.10876
  1  HOUSTON                0.05035497      0.00273      18.43136
  2  PHOENIX               -0.00424832      0.00274      -1.55256
  3  CHEVROLET             -0.00010145      0.00274      -0.03706
  4  FORD                   0.00359244      0.00273       1.31615
  5  HOUS X CHEV            0.00714786      0.00388       1.84256
  6  HOUS X FORD            0.00757075      0.00386       1.96321
  7  PHOE X CHEV           -0.01133820      0.00388      -2.92495
  8  PHOE X FORD            0.00698092      0.00386       1.81062
  9  ODOM. MILES            0.01134966      0.00131       8.68657
```

TABLE 4a -- FULL DATA SET

Data adjusted for miles

```
DVAR                         SE DVAR  DVAR                       SE DVAR
 14  CE HC FID         1089.55981445   31  LOG CE HC FI       0.10107989

IVAR                     COEFFICIENT  IVAR                   COEFFICIENT
  0                    3575.91992187    0                     3.53842068

DVAR                         SE DVAR  DVAR                       SE DVAR
 15  CW HC FID            0.00298872   32  LOG CW HC FI       0.12114346

IVAR                     COEFFICIENT  IVAR                   COEFFICIENT
  0                       0.00860570    0                    -2.08676434

DVAR                         SE DVAR  DVAR                       SE DVAR
 16  CE CO                0.68952787   33  LOG CE HC IR       0.11436391

IVAR                     COEFFICIENT  IVAR                   COEFFICIENT
  0                       1.58101273    0                     3.25987911

DVAR                         SE DVAR  DVAR                       SE DVAR
 17  CW CO                0.03837229   34  LOG CW HC IR       0.12621776

IVAR                     COEFFICIENT  IVAR                   COEFFICIENT
  0                       0.07808989    0                    -2.36930209

DVAR                         SE DVAR  DVAR                       SE DVAR
 18  CE NOX             572.40991211   35  LOG CE NOX         0.13904876

IVAR                     COEFFICIENT  IVAR                   COEFFICIENT
  0                    1920.17700195    0                     3.26228523

DVAR                         SE DVAR  DVAR                       SE DVAR
 19  CW NOX               0.00508531   36  LOG CW NOX         0.15029287

IVAR                     COEFFICIENT  IVAR                   COEFFICIENT
  0                       0.01525680    0                    -1.84171772

DVAR                         SE DVAR  DVAR                       SE DVAR
 23  CE HC IR           727.67724609   37  LOG CE CO          0.16731811

IVAR                     COEFFICIENT  IVAR                   COEFFICIENT
  0                    1899.17431641    0                     0.15627962

DVAR                         SE DVAR  DVAR                       SE DVAR
 24  CW HC IR             0.00182998   38  LOG CW CO          0.18586111

IVAR                     COEFFICIENT  IVAR                   COEFFICIENT
  0                       0.00553823    0                    -1.16331482

DVAR                         SE DVAR  DVAR                       SE DVAR
 25  CE CO2               0.34919983   39  LOG CE CO2         0.01481741

IVAR                     COEFFICIANT  IVAR                   COEFFICIENT
  0                      13.31980896    0                     1.12429810

DVAR                         SE DVAR  DVAR                       SE DVAR
 26  CW CO2               0.15148205   40  LOG CW CO2         0.06555748

IVAR                     COEFFICIENT  IVAR                   COEFFICIENT
  0                       1.01806002    0                     0.00089934
```

TABLE 5a -- FULL DATA SET

Data adjusted for miles: Cities

```
DVAR                          SE DVAR        SD DVAR          R DVAR    R-SQUARED
 14   CE HC FID         1081.36474609  1089.55981         0.13320      0.02

IVAR                      COEFFICIENT      SD COEFF            T
   0                    3575.61035156    40.41280        88.47717
   1   HOUSTON            94.23173850    57.19212         1.64763
   2   PHOENIX          -204.99299622    57.19214        -3.58429

DVAR                          SE DVAR        SD DVAR          R DVAR    R-SQUARED
 15   CW HC FID            0.00285440     0.00299         0.30070      0.09

IVAR                      COEFFICIENT      SD COEFF            T
   0                       0.00860732     0.00011        80.68759
   1   HOUSTON             0.00126966     0.00015         8.41023
   2   PHOENIX            -0.00068705     0.00015        -4.55101

DVAR                          SE DVAR        SD DVAR          R DVAR    R-SQUARED
 16   CE CO                0.68870576     0.68953         0.08136      0.01

IVAR                      COEFFICIENT      SD COEFF            T
   0                       1.58116341     0.02572        61.47691
   1   HOUSTON             0.07723510     0.03640         2.12194
   2   PHOENIX            -0.02309963     0.03640        -0.63463

DVAR                          SE DVAR        SD DVAR          R DVAR    R-SQUARED
 17   CW CO                0.03722348     0.03837         0.24822      0.06

IVAR                      COEFFICIENT      SD COEFF            T
   0                       0.07811588     0.00139        56.15334
   1   HOUSTON             0.01307281     0.00197         6.65030
   2   PHOENIX            -0.00375521     0.00197        -1.90745

DVAR                          SE DVAR        SD DVAR          R DVAR    R-SQUARED
 18   CE NOX             569.41748047   572.40942         0.11487      0.01

IVAR                      COEFFICIENT      SD COEFF            T
   0                    1920.43334961    21.28029        90.24469
   1   HOUSTON            34.50956726    30.11583         1.14589
   2   PHOENIX            57.35122681    30.11583         1.90439

DVAR                          SE DVAR        SD DVAR          R DVAR    R-SQUARED
 19   CW NOX               0.00478016     0.00509         0.34479      0.17

IVAR                      COEFFICIENT      SD COEFF            T
   0                       0.01526299     0.00018        85.43781
   1   HOUSTON             0.00206608     0.00025         8.17223
   2   PHOENIX             0.00014845     0.00025         0.58719

DVAR                          SE DVAR        SD DVAR          R DVAR    R-SQUARED
 23   CE HC IR           710.16381836   727.67700         0.22410      0.05

IVAR                      COEFFICIENT      SD COEFF            T
   0                    1898.65527344    26.54027        71.53865
   1   HOUSTON            25.10772705    37.55974         0.66847
   2   PHOENIX          -210.86245728    37.55974        -5.61405
```

TABLE 5b -- FULL DATA OFF

Data adjusted for miles. Cities

```
DVAR                              SE DVAR        SD DVAR          R DVAR    R-SQUARED
 24  CW HC IR                   0.00174580       0.00193         0.26741       0.07

IVAR                            COEFFICIENT      SD COEFF           T
  0                              0.00493833      0.00007        68.77161
  1  HOUSTON                     0.00061839      0.00009         6.62154
  2  PHOENIX                    -0.00057923      0.00009        -6.20216

DVAR                              SE DVAR        SD DVAR          R DVAR    R-SQUARED
 25  CE CO2                     0.34451836       0.34907         0.16929       0.03

IVAR                            COEFFICIENT      SD COEFF           T
  0                             13.31998062      0.01288      1034.53320
  1  HOUSTON                    -0.01883199      0.01822        -1.03363
  2  PHOENIX                     0.08079427      0.01822         4.43408

DVAR                              SE DVAR        SD DVAR          R DVAR    R-SQUARED
 26  CW CO2                     0.12005448       0.15148         0.61127       0.37

IVAR                            COEFFICIENT      SD COEFF           T
  0                              1.01439186      0.00449       226.08070
  1  HOUSTON                     0.12033062      0.00635        18.95233
  2  PHOENIX                    -0.01575952      0.00635        -2.48199

DVAR                              SE DVAR        SD DVAR          R DVAR    R-SQUARED
 31  LOG CE HC FI               0.10028481       0.10108         0.13349       0.02

IVAR                            COEFFICIENT      SD COEFF           T
  0                              3.53819684      0.00375       944.11926
  1  HOUSTON                     0.01109426      0.00530         2.09170
  2  PHOENIX                    -0.01929240      0.00530        -3.63737

DVAR                              SE DVAR        SD DVAR          R DVAR    R-SQUARED
 32  LOG CW HC FI               0.11300558       0.12114         0.36369       0.13

IVAR                            COEFFICIENT      SD COEFF           T
  0                             -2.08666325      0.00422      -494.08984
  1  HOUSTON                     0.06204750      0.00598        10.38151
  2  PHOENIX                    -0.02621849      0.00598        -4.38676

DVAR                              SE DVAR        SD DVAR          R DVAR    R-SQUARED
 33  LOG CE HC IR               0.11018407       0.11436         0.27268       0.07

IVAR                            COEFFICIENT      SD COEFF           T
  0                              3.25978661      0.00412       791.63257
  1  HOUSTON                     0.00945363      0.00583         1.62224
  2  PHOENIX                    -0.04200097      0.00583        -7.20736

DVAR                              SE DVAR        SD DVAR          R DVAR    R-SQUARED
 34  LOG CW HC IR               0.11795908       0.12621         0.35905       0.13

IVAR                            COEFFICIENT      SD COEFF           T
  0                             -2.36526986      0.00441      -536.54053
  1  HOUSTON                     0.06040142      0.00624         9.68170
  2  PHOENIX                    -0.04912969      0.00624        -7.84291
```

TABLE 5c -- FULL DATA SET

Data adjusted for miles. Cities

```
DVAR                             SE DVAR       SD DVAR        R DVAR    R-SQUARED
 35  LOG CE NOX                0.13851368     0.13905       0.10226      0.01

IVAR                          COEFFICIENT     SD COEFF         T
  0                            3.26233307     0.00518     630.21533
  1  HOUSTON                   0.00096039     0.00733       0.13110
  2  PHOENIX                   0.01688068     0.00733       2.30536

DVAR                             SE DVAR       SD DVAR        R DVAR    R-SQUARED
 36  LOG CW NOX                0.14293506     0.15029       0.31299      0.10

IVAR                          COEFFICIENT     SD COEFF         T
  0                           -1.84154415     0.00534    -344.74390
  1  HOUSTON                   0.05190581     0.00756       6.86615
  2  PHOENIX                   0.00996326     0.00756       1.31795

DVAR                             SE DVAR       SD DVAR        R DVAR    R-SQUARED
 37  LOG CE CO                 0.16586477     0.16732       0.14158      0.02

IVAR                          COEFFICIENT     SD COEFF         T
  0                            0.15637237     0.00620      25.22661
  1  HOUSTON                   0.01349588     0.00877       1.53865
  2  PHOENIX                   0.01974161     0.00877       2.25042

DVAR                             SE DVAR       SD DVAR        R DVAR    R-SQUARED
 38  LOG CW CO                 0.17661071     0.18586       0.31558      0.10

IVAR                          COEFFICIENT     SD COEFF         T
  0                           -1.16309836     0.00660    -176.21896
  1  HOUSTON                   0.06442606     0.00934       6.89732
  2  PHOENIX                   0.01283723     0.00934       1.37433

DVAR                             SE DVAR       SD DVAR        R DVAR    R-SQUARED
 39  LOG CE CO2                0.01469863     0.01482       0.13603      0.02

IVAR                          COEFFICIENT     SD COEFF         T
  0                            1.12630280     0.00055    2066.72656
  1  HOUSTON                  -0.0000639      0.00078      -0.08278
  2  PHOENIX                   0.0027396      0.00078       3.52386

DVAR                             SE DVAR       SD DVAR        R DVAR    R-SQUARED
 40  LOG CW CO2                0.05238446     0.06556       0.60273      0.36

IVAR                          COEFFICIENT     SD COEFF         T
  0                            0.00102826     0.00196       0.52518
  1  HOUSTON                   0.05026358     0.00277      18.14929
  2  PHOENIX                  -0.00416665     0.00277      -1.50318
```

```
                         TABLE 6a -- FULL DATA SET

              Data adjusted for miles, Cities and car makes.


DVAR                        SE DVAR       SD DVAR          R DVAR   R-SQUARED
 14  CE HC FID           988.45141602  1089.55981         0.42613     0.18

IVAR                     COEFFICIENT    SD COEFF             T
  0                     3572.21411133   36.94160         96.69893
  1  HOUSTON              92.53312520   52.27825          1.77002
  2  PHOENIX            -206.69097900   52.27826         -3.95367
  3  CHEVROLET          -606.18457031   52.39030        -11.57055
  4  FORD                171.82946303   52.16971          3.29366

DVAR                        SE DVAR       SD DVAR          R DVAR   R-SQUARED
 15  CW HC FID             0.00264804     0.00299         0.46838     0.22

IVAR                     COEFFICIENT    SD COEFF             T
  0                        0.00859906     0.00010         86.88910
  1  HOUSTON               0.00126552     0.00014          9.03605
  2  PHOENIX              -0.00069138     0.00014         -4.93519
  3  CHEVROLET            -0.00147732     0.00014        -10.52364
  4  FORD                  0.00042544     0.00014          3.04403

DVAR                        SE DVAR       SD DVAR          R DVAR   R-SQUARED
 16  CE CO                 0.65965080     0.68953         0.29984     0.09

IVAR                     COEFFICIENT    SD COEFF             T
  0                        1.58028412     0.02465         64.10037
  1  HOUSTON               0.07679570     0.03489          2.20119
  2  PHOENIX              -0.02353898     0.03489         -0.67470
  3  CHEVROLET            -0.15684831     0.03496         -4.48611
  4  FORD                 -0.12341094     0.03482         -3.54467

DVAR                        SE DVAR       SD DVAR          R DVAR   R-SQUARED
 17  CW CO                 0.03591511     0.03813         0.35899     0.13

IVAR                     COEFFICIENT    SD COEFF             T
  0                        0.07807529     0.00134         58.16689
  1  HOUSTON               0.01305252     0.00190          6.87150
  2  PHOENIX              -0.00377549     0.00190         -1.98761
  3  CHEVROLET            -0.00724022     0.00190         -3.80346
  4  FORD                 -0.00680102     0.00190         -3.58050

DVAR                        SE DVAR       SD DVAR          R DVAR   R-SQUARED
 18  CE NOX              480.06811523   572.40942         0.54823     0.30

IVAR                     COEFFICIENT    SD COEFF             T
  0                     1918.07543945   17.94160        106.90611
  1  HOUSTON               33.33067322   25.39036          1.31273
  2  PHOENIX               56.17231750   25.39035          2.21235
  3  CHEVROLET           -420.86401367   25.44476        -16.54030
  4  FORD                 116.13258103   25.33762          4.58340
```

TABLE 6b -- FULL DATA SET
Data adjusted for miles. Cities and car makes.

```
DVAR                          SE DVAR       SD DVAR        R DVAR    R-SQUARED
 19  CW NOX                  0.00408167    0.00509        0.59967      0.36

IVAR                       COEFFICIENT     SD COEFF          T
  0                          0.01524386    0.00015      99.92836
  1  HOUSTON                 0.00205642    0.00022       9.52589
  2  PHOENIX                 0.00013879    0.00022       0.64290
  3  CHEVROLET              -0.00344970    0.00022     -15.94616
  4  FORD                    0.00106303    0.00022       4.93450

DVAR                          SE DVAR       SD DVAR        R DVAR    R-SQUARED
 23  CE HC IR              687.40332031  727.67700        0.33959      0.11

IVAR                       COEFFICIENT     SD COEFF          T
  0                       1897.20344727   25.69066      73.85167
  1  HOUSTON                24.62193604   36.35609       0.67174
  2  PHOENIX              -211.54821777   36.35611      -5.81878
  3  CHEVROLET            -244.82499695   36.43402      -6.71968
  4  FORD                  191.46243286   36.28061       5.27727

DVAR                          SE DVAR       SD DVAR        R DVAR    R-SQUARED
 24  CW HC IR                0.00170594    0.00183        0.36855      0.14

IVAR                       COEFFICIENT     SD COEFF          T
  0                          0.00453481    0.00006      71.12726
  1  HOUSTON                 0.00061663    0.00009       6.83437
  2  PHOENIX                -0.00058099    0.00009      -6.43927
  3  CHEVROLET              -0.00062795    0.00009      -6.96407
  4  FORD                    0.00048255    0.00009       5.35961

DVAR                          SE DVAR       SD DVAR        R DVAR    R-SQUARED
 25  CE CO2                  0.33753806    0.34907        0.26502      0.07

IVAR                       COEFFICIENT     SD COEFF          T
  0                         13.32020473    0.01261    1055.91162
  1  HOUSTON                -0.01872182    0.01785      -1.04872
  2  PHOENIX                 0.08090039    0.01785       4.53209
  3  CHEVROLET               0.04004343    0.01789       2.23827
  4  FORD                    0.05971260    0.01781       3.35182

DVAR                          SE DVAR       SD DVAR        R DVAR    R-SQUARED
 26  CW CO2                  0.11985375    0.15148        0.61550      0.38

IVAR                       COEFFICIENT     SD COEFF          T
  0                          1.01435661    0.00448     226.45131
  1  HOUSTON                 0.12035180    0.00635      18.95467
  2  PHOENIX                -0.01575650    0.00634      -2.48566
  3  CHEVROLET               0.00107586    0.00635       0.16936
  4  FORD                    0.01088737    0.00633       1.72111
```

TABLE 6e -- FULL DATA SET

Data adjusted for miles, Cities and car makes

```
DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 31  LOG CE HC FI             0.08545238       0.10105       0.53747      0.29

IVAR                         COEFFICIENT       SD COEFF          T
  0                           3.53798866       0.00319    1107.82642
  1  HOUSTON                  0.01089026       0.00452       2.40962
  2  PHOENIX                 -0.01949638       0.00452      -4.31384
  3  CHEVROLET               -0.07281971       0.00453     -16.07788
  4  FORD                     0.02261924       0.00451       5.01523

DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 32  LOG CW HC FI             0.09966809       0.12114       0.57176      0.33

IVAR                         COEFFICIENT       SD COEFF          T
  0                          -2.08707809       0.00372    -560.30176
  1  HOUSTON                  0.06183971       0.00527      11.73125
  2  PHOENIX                 -0.02642645       0.00527      -5.01322
  3  CHEVROLET               -0.07424670       0.00528     -14.05483
  4  FORD                     0.02421148       0.00526       4.60259

DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 33  LOG CE HC IR             0.10329741       0.11436       0.43443      0.19

IVAR                         COEFFICIENT       SD COEFF          T
  0                           3.25949287       0.00386     844.30640
  1  HOUSTON                  0.00930700       0.00546       1.70355
  2  PHOENIX                 -0.04214759       0.00546      -7.71467
  3  CHEVROLET               -0.05234404       0.00548      -9.56054
  4  FORD                     0.04018581       0.00545       7.37090

DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 34  LOG CW HC IR             0.11115980       0.12621       0.47813      0.23

IVAR                         COEFFICIENT       SD COEFF          T
  0                          -2.36557007       0.00415    -569.41309
  1  HOUSTON                  0.06025081       0.00588      10.24825
  2  PHOENIX                 -0.04908029       0.00588      -8.34822
  3  CHEVROLET               -0.05376712       0.00589      -9.12505
  4  FORD                     0.04177192       0.00587       7.11990

DVAR                            SE DVAR        SD DVAR        R DVAR    R-SQUARED
 35  LOG CE NOX               0.11855257       0.13905       0.52645      0.28

IVAR                         COEFFICIENT       SD COEFF          T
  0                           3.26176929       0.00443     736.17651
  1  HOUSTON                  0.00067843       0.00627       0.10820
  2  PHOENIX                  0.01660671       0.00627       2.64854
  3  CHEVROLET               -0.10066128       0.00628     -16.01974
  4  FORD                     0.03743301       0.00626       5.98247
```

TABLE 63 -- FULL DATA SET

Data adjusted for miles. Cities and car makes.

```
DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 36  LOG CW NOX                 0.12317598     0.15029       0.57619     0.33

IVAR                          COEFFICIENT     SD COEFF          T
  0                           -1.84211540     0.00460    -400.15674
  1  HOUSTON                   0.05161984     0.00651       7.92365
  2  PHOENIX                   0.00967729     0.00651       1.48566
  3  CHEVROLET                -0.10208797     0.00653     -15.63698
  4  FORD                      0.03901053     0.00650       6.00058

DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 37  LOG CE CO                  0.16389966     0.16732       0.21404     0.05

IVAR                          COEFFICIENT     SD COEFF          T
  0                            0.15621680     0.00613      25.50287
  1  HOUSTON                   0.01341812     0.00867       1.54792
  2  PHOENIX                   0.01966385     0.00867       2.26843
  3  CHEVROLET                -0.02775970     0.00869      -3.19592
  4  FORD                     -0.00855800     0.00865      -0.98815

DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 38  LOG CW CO                  0.17473847     0.18586       0.34792     0.12

IVAR                          COEFFICIENT     SD COEFF          T
  0                           -1.16326141     0.00653    -178.12642
  1  HOUSTON                   0.06434405     0.00924       6.96232
  2  PHOENIX                   0.01275527     0.00924       1.38018
  3  CHEVROLET                -0.02925861     0.00926      -3.15915
  4  FORD                     -0.00703804     0.00922      -0.76313

DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 39  LOG CE CO2                 0.01450511     0.01482       0.21696     0.05

IVAR                          COEFFICIENT     SD COEFF          T
  0                            1.12430954     0.00054    2071.97996
  1  HOUSTON                  -0.00063951     0.00077      -0.83361
  2  PHOENIX                   0.00274342     0.00077       3.57607
  3  CHEVROLET                 0.00142732     0.00077       1.85654
  4  FORD                      0.00207215     0.00077       2.70668

DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 40  LOG CW CO2                 0.05237729     0.06556       0.60436     0.37

IVAR                          COEFFICIENT     SD COEFF          T
  0                            0.00102772     0.00196       0.52502
  1  HOUSTON                   0.05028336     0.00277      18.15163
  2  PHOENIX                  -0.00416587     0.00277      -1.50356
  3  CHEVROLET                -0.00007796     0.00278      -0.02807
  4  FORD                      0.00358019     0.00276       1.29509
```

TABLE 7a -- FULL DATA SET

Data adjusted for miles. Cities, car makes and interactions.

```
DVAR                                SE DVAR        SD DVAR          R DVAR    R-SQUARED
 14  CE HC FID                    985.36718750  1089.55981        0.43734      0.19

IVAR                              COEFFICIENT     SD COEFF           T
  0                              3572.56713867    36.82692       97.00966
  1   HOUSTON                      92.59199524    52.11801        1.77658
  2   PHOENIX                    -206.39602661    52.11803       -3.96017
  3   CHEVROLET                  -605.47680664    52.22850      -11.59284
  4   FORD                        171.47584534    52.00734        3.29715
  5   HOUS X CHEV                  48.35844421    73.96619        0.65379
  6   HOUS X FORD                  59.40986633    73.57556        0.80747
  7   PHOE X CHEV                  76.46717834    73.96613        1.03381
  8   PHOE X FORD                  27.48487854    73.57556        0.37356

DVAR                                SE DVAR        SD DVAR          R DVAR    R-SQUARED
 15  CW HC FID                      0.00262142     0.00299        0.58918      0.34

IVAR                              COEFFICIENT     SD COEFF           T
  0                                 0.00859971     0.00010       87.77765
  1   HOUSTON                       0.00126607     0.00014        9.13138
  2   PHOENIX                      -0.00069107     0.00014       -4.98419
  3   CHEVROLET                    -0.00147568     0.00014      -10.62066
  4   FORD                          0.00042677     0.00014        3.07015
  5   HOUS X CHEV                   0.00014452     0.00020        0.73452
  6   HOUS X FORD                   0.00037182     0.00020        1.89960
  7   PHOE X CHEV                   0.00009204     0.00020        0.46772
  8   PHOE X FORD                   0.00019864     0.00020        1.01486

DVAR                                SE DVAR        SD DVAR          R DVAR    R-SQUARED
 16  CE CO                          0.65391159     0.68953        0.33272      0.11

IVAR                              COEFFICIENT     SD COEFF           T
  0                                 1.58067759     0.02444       64.67805
  1   HOUSTON                       0.07667953     0.03459        2.21702
  2   PHOENIX                      -0.02302685     0.03459       -0.66577
  3   CHEVROLET                    -0.15605599     0.03466       -4.50248
  4   FORD                         -0.12380695     0.03451       -3.58723
  5   HOUS X CHEV                   0.03253510     0.04909        0.66282
  6   HOUS X FORD                  -0.07900852     0.04883       -1.61815
  7   PHOE X CHEV                   0.10728513     0.04909        2.18565
  8   PHOE X FORD                   0.06245255     0.04883        1.27907

DVAR                                SE DVAR        SD DVAR          R DVAR    R-SQUARED
 17  CW CO                          0.03557578     0.03837        0.38738      0.15

IVAR                              COEFFICIENT     SD COEFF           T
  0                                 0.07809686     0.00133       58.73549
  1   HOUSTON                       0.01309914     0.00188        6.96017
  2   PHOENIX                      -0.00376245     0.00188       -1.99992
  3   CHEVROLET                    -0.00720088     0.00189       -3.81076
  4   FORD                         -0.00682260     0.00188       -3.63357
  5   HOUS X CHEV                   0.00308955     0.00267        1.15693
  6   HOUS X FORD                  -0.00335229     0.00266       -1.26198
  7   PHOE X CHEV                   0.00385301     0.00267        1.44281
  8   PHOE X FORD                   0.00531802     0.00266        2.00198
```

TABLE 7b -- FULL DATA SET

Data adjusted for miles. Cities, car makes and interactions.

```
DVAR                             SE DVAR        SD DVAR          R DVAR    R-SQUARED
 18  CE NOX                  453.77343750      572.40942         0.61530     0.38

IVAR                          COEFFICIENT      SD COEFF             T
  0                         1917.62695312       16.95923     113.07277
  1   HOUSTON                 32.53961182       24.00096       1.35576
  2   PHOENIX                 56.91521301       24.00098       2.37470
  3   CHEVROLET             -421.75976562       24.05185     -17.53543
  4   FORD                   116.58050537       23.95000       4.86766
  5   HOUS X CHEV           -146.56246948       34.06232      -4.30277
  6   HOUS X FORD            166.12783508       33.88243       4.96800
  7   PHOE X CHEV            -11.62141410       34.06229      -0.3[illegible]
  8   PHOE X FORD           -223.38490295       33.88243      -6.59294

DVAR                             SE DVAR        SD DVAR          R DVAR    R-SQUARED
 19  CW NOX                    0.00386478        0.00509         0.65489     0.43

IVAR                          COEFFICIENT      SD COEFF             T
  0                            0.01523910        0.00014     105.50404
  1   HOUSTON                  0.00204921        0.00020      10.02469
  2   PHOENIX                  0.00014153        0.00020       0.69234
  3   CHEVROLET               -0.00345872        0.00020     -16.88423
  4   FORD                     0.00106750        0.00020       5.23332
  5   HOUS X CHEV             -0.00138111        0.00029      -4.76069
  6   HOUS X FORD              0.00191613        0.00029       6.63995
  7   PHOE X CHEV             -0.00019729        0.00029      -0.68007
  8   PHOE X FORD             -0.00162686        0.00029      -5.63793

DVAR                             SE DVAR        SD DVAR          R DVAR    R-SQUARED
 23  CE HC IR                687.00683594      727.67700         0.34443     0.12

IVAR                          COEFFICIENT      SD COEFF             T
  0                         1897.44213867       25.67606      73.89928
  1   HOUSTON                 24.17362976       36.33716       0.66526
  2   PHOENIX               -211.14071655       36.33716      -5.81060
  3   CHEVROLET             -244.50654602       36.41617      -6.71460
  4   FORD                   191.30320740       36.25998       5.27588
  5   HOUS X CHEV            -10.91868606       51.56989      -0.21169
  6   HOUS X FORD             59.54861450       51.29753       1.16085
  7   PHOE X CHEV             67.11614990       51.56984       1.30146
  8   PHOE F FORD            -15.60071659       51.29753      -0.30412

DVAR                             SE DVAR        SD DVAR          R DVAR    R-SQUARED
 24  CW HC IR                  0.00169393        0.00183         0.39082     0.15

IVAR                          COEFFICIENT      SD COEFF             T
  0                            0.00453512        0.00006      71.63525
  1   HOUSTON                  0.00061613        0.00009       6.87685
  2   PHOENIX                 -0.00058017        0.00009      -6.47545
  3   CHEVROLET               -0.00062732        0.00009      -6.98686
  4   FORD                     0.00048223        0.00009       5.39383
  5   HOUS X CHEV             -0.00002272        0.00013      -0.17870
  6   HOUS X FORD              0.00030583        0.00013       2.41797
  7   PHOE X CHEV              0.00013391        0.00013       1.05315
  8   PHOE F FORD              0.00000966        0.00013       0.07639
```

TABLE 7c -- FULL DATA SET

Data adjusted for miles. Cities, car makes and interactions.

```
DVAR                          SE DVAR        SD DVAR        R DVAR    R-SQUARED
 29  CE CO2                  0.32531691      0.34907        0.37577     0.14

IVAR                        COEFFICIENT     SD COEFF          T
  0                          13.31995106     0.01216     1095.54102
  1  HOUSTON                 -0.01866236     0.01721       -1.08460
  2  PHOENIX                  0.08059525     0.01721        4.68396
  3  CHEVROLET                0.03954030     0.01724        2.29310
  4  FORD                     0.05994616     0.01717        3.49236
  5  HOUS X CHEV             -0.02235836     0.02442       -0.91558
  6  HOUS X FORD              0.00157912     0.02429        0.06501
  7  PHOE X CHEV             -0.06645237     0.02442       -2.72085
  8  PHOE X FORD             -0.08232862     0.02429       -3.38929

DVAR                          SE DVAR        SD DVAR        R DVAR    R-SQUARED
 26  CW CO2                  0.11787486      0.15148        0.63346     0.40

IVAR                        COEFFICIENT     SD COEFF          T
  0                           1.01433756     0.00441      230.24702
  1  HOUSTON                  0.12052687     0.00623       19.33185
  2  PHOENIX                 -0.01595996     0.00623       -2.55980
  3  CHEVROLET                0.00104006     0.00625        0.16646
  4  FORD                     0.01090527     0.00622        1.75287
  5  HOUS X CHEV              0.01998282     0.00885        2.25840
  6  HOUS X FORD              0.01820492     0.00880        2.06839
  7  PHOE X CHEV             -0.02630517     0.00885       -2.97293
  8  PHOE X FORD              0.01338316     0.00880        1.52055

DVAR                          SE DVAR        SD DVAR        R DVAR    R-SQUARED
 31  LOG CE HC FI            0.08546269      0.10105        0.54102     0.29

IVAR                        COEFFICIENT     SD COEFF          T
  0                           3.53800869     0.00319     1107.68164
  1  HOUSTON                  0.01090747     0.00452        2.41300
  2  PHOENIX                 -0.01949260     0.00452       -4.31225
  3  CHEVROLET               -0.07277769     0.00453      -16.06616
  4  FORD                     0.02259825     0.00451        5.00993
  5  HOUS X CHEV              0.00450300     0.00642        0.70192
  6  HOUS X FORD              0.00447058     0.00638        0.70057
  7  PHOE X CHEV              0.00290362     0.00642        0.45262
  8  PHOE X FORD             -0.00008556     0.00638       -0.01341

DVAR                          SE DVAR        SD DVAR        R DVAR    R-SQUARED
 32  LOG CW HC FI            0.09863220      0.12114        0.58697     0.34

IVAR                        COEFFICIENT     SD COEFF          T
  0                          -2.08705902     0.00369     -566.17188
  1  HOUSTON                  0.06192606     0.00522       11.87038
  2  PHOENIX                 -0.02649943     0.00522       -5.07881
  3  CHEVROLET               -0.07421148     0.00523      -14.19524
  4  FORD                     0.02419396     0.00521        4.64752
  5  HOUS X CHEV              0.01234747     0.00740        1.66772
  6  HOUS X FORD              0.01198470     0.00736        1.62733
  7  PHOE X CHEV             -0.00615849     0.00740       -0.83180
  8  PHOE X FORD              0.00968797     0.00736        1.31646
```

TABLE 74 -- FULL DATA SET

Data adjusted for miles, Cities, car makes and interactions.

```
DVAR                               SE DVAR        SD DVAR        R DVAR    R-SQUARED
 33  LOG CE HC IR                0.10337630      0.11436        0.43789      0.19

IVAR                            COEFFICIENT     SD COEFF          T
  0                              3.25950527      0.00386     843.48877
  1  HOUSTON                     0.00925794      0.00547       1.69285
  2  PHOENIX                    -0.04208348      0.00547      -7.69515
  3  CHEVROLET                  -0.05231392      0.00548      -9.54559
  4  FORD                        0.04017074      0.00546       7.36103
  5  HOUS X CHEV                -0.00407670      0.00776      -0.52525
  6  HOUS X FORD                 0.00856012      0.00772       1.10876
  7  PHOE X CHEV                 0.00939013      0.00776       1.20985
  8  PHOE X FORD                -0.00529151      0.00772      -0.68539

DVAR                               SE DVAR        SD DVAR        R DVAR    R-SQUARED
 34  LOG CW HC IR                0.11057254      0.12621        0.49086      0.24

IVAR                            COEFFICIENT     SD COEFF          T
  0                             -2.36555767      0.00413    -572.39282
  1  HOUSTON                     0.06027106      0.00585      10.30490
  2  PHOENIX                    -0.04908894      0.00585      -8.39109
  3  CHEVROLET                  -0.05374391      0.00586      -9.16955
  4  FORD                        0.04176031      0.00584       7.15526
  5  HOUS X CHEV                 0.00376815      0.00830       0.45396
  6  HOUS X FORD                 0.01607242      0.00826       1.94659
  7  PHOE X CHEV                 0.00032849      0.00830       0.03957
  8  PHOE X FORD                 0.00448310      0.00826       0.54296

DVAR                               SE DVAR        SD DVAR        R DVAR    R-SQUARED
 35  LOG CE NOX                  0.11260235      0.13905        0.59292      0.35

IVAR                            COEFFICIENT     SD COEFF          T
  0                              3.26169581      0.00421     775.03057
  1  HOUSTON                     0.00046371      0.00596       0.07786
  2  PHOENIX                     0.01671050      0.00596       2.80575
  3  CHEVROLET                  -0.10068329      0.00597     -16.90296
  4  FORD                        0.03754403      0.00594       6.31723
  5  HOUS X CHEV                -0.03854215      0.00845      -4.55958
  6  HOUS X FORD                 0.04298088      0.00841       5.11202
  7  PHOE X CHEV                -0.00065240      0.00845      -0.07719
  8  PHOE X FORD                -0.05238244      0.00841      -6.23021

DVAR                               SE DVAR        SD DVAR        R DVAR    R-SQUARED
 36  LOG CW NOX                  0.11829424      0.15029        0.62272      0.39

IVAR                            COEFFICIENT     SD COEFF          T
  0                             -1.84222889      0.00442    -416.83097
  1  HOUSTON                     0.05147561      0.00625       8.22972
  2  PHOENIX                     0.00970823      0.00625       1.55215
  3  CHEVROLET                  -0.10231686      0.00627     -16.32379
  4  FORD                        0.03912501      0.00624       6.26861
  5  HOUS X CHEV                -0.03070021      0.00888      -3.45851
  6  HOUS X FORD                 0.05049821      0.00883       5.71906
  7  PHOE X CHEV                -0.00971392      0.00888      -1.09427
  8  PHOE X FORD                -0.04261201      0.00883      -4.82592
```

TABLE 7a -- FULL DATA SET

Data adjusted for miles. Cities, car makes and interactions.

```
DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 37  LOG CE CO                  0.16353466     0.16732       0.23538     0.06

IVAR                            COEFFICIENT    SD COEFF          T
  0                              0.15629576     0.00611      25.57216
  1   HOUSTON                    0.01344496     0.00865       1.55439
  2   PHOENIX                    0.01971501     0.00865       2.27928
  3   CHEVROLET                 -0.02760367     0.00867      -3.18455
  4   FORD                      -0.00862600     0.00863      -0.99939
  5   HOUS X CHEV                0.01232162     0.01228       1.00374
  6   HOUS X FORD               -0.02032819     0.01221      -1.66477
  7   PHOE X CHEV                0.01521627     0.01228       1.23955
  8   PHOE X FORD               -0.00537578     0.01221      -0.44025

DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 38  LOG CW CO                  0.17462742     0.18586       0.35652     0.13

IVAR                            COEFFICIENT    SD COEFF          T
  0                             -1.16318512     0.00653    -178.22525
  1   HOUSTON                    0.06444025     0.00924       6.97678
  2   PHOENIX                    0.01273153     0.00924       1.37863
  3   CHEVROLET                 -0.02910937     0.00926      -3.14493
  4   FORD                      -0.00711265     0.00922      -0.77171
  5   HOUS X CHEV                0.02019504     0.01311       1.54063
  6   HOUS X FORD               -0.01283077     0.01304      -0.98402
  7   PHOE X CHEV                0.00614526     0.01311       0.46873
  8   PHOE X FORD                0.00439691     0.01304       0.33721

DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 39  LOG CE CO2                 0.01419861     0.01482       0.30340     0.09

IVAR                            COEFFICIENT    SD COEFF          T
  0                              1.12429905     0.00053    2118.69653
  1   HOUSTON                   -0.00063727     0.00075      -0.84857
  2   PHOENIX                    0.00275270     0.00075       3.63879
  3   CHEVROLET                  0.00141037     0.00075       1.87403
  4   FORD                       0.00208063     0.00075       2.77640
  5   HOUS X CHEV               -0.00072495     0.00107      -0.68016
  6   HOUS X FORD                0.00007201     0.00106       0.06793
  7   PHOE X CHEV               -0.00226736     0.00107      -2.12733
  8   PHOE X FORD               -0.00279019     0.00106      -2.63180

DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 40  LOG CW CO2                 0.05159774     0.06556       0.62247     0.39

IVAR                            COEFFICIENT    SD COEFF          T
  0                              0.00101585     0.00193       0.52678
  1   HOUSTON                    0.05035510     0.00273      18.45113
  2   PHOENIX                   -0.00424847     0.00273      -1.55672
  3   CHEVROLET                 -0.00010168     0.00273      -0.03718
  4   FORD                       0.00359206     0.00272       1.31901
  5   HOUS X CHEV                0.00714792     0.00387       1.84550
  6   HOUS X FORD                0.00757073     0.00385       1.96504
  7   PHOE X CHEV               -0.01133829     0.00387      -2.92740
  8   PHOE X FORD                0.00698086     0.00385       1.81194
```

TABLE 8a -- FULL DATA SET

Cities, car makes, interactions and log miles as covariate.

```
DVAR                        SE DVAR      SD DVAR        R DVAR   R-SQUARED
 14  CE HC FID          955,93505859  1174,07202       0,53868     0,29

IVAR                    COEFFICIENT     SD COEFF          T
  0                     740,96508789   290,91382       2,54703
  1  HOUSTON             98,26264954    50,56287       1,94338
  2  PHOENIX           -215,10258484    50,58086      -4,25265
  3  CHEVROLET         -609,32324219    50,67061     -12,02522
  4  FORD               173,12664795    50,45613       3,43122
 10  LOG MILES          709,99658203    72,39452       9,80733
  5  HOUS X CHEV         59,53437805    71,83420       0,82877
  6  HOUS X FORD         52,80865479    71,39960       0,73962
  7  PHOE X CHEV         80,37310791    71,75801       1,12006
  8  PHOE X FORD         25,40522766    71,37991       0,35592

DVAR                        SE DVAR      SD DVAR        R DVAR   R-SQUARED
 15  CW HC FID            0,00759232     0,00320       0,59278     0,35

IVAR                    COEFFICIENT     SD COEFF          T
  0                      -0,00063359     0,00079      -0,81718
  1  HOUSTON              0,00129376     0,00014       9,43552
  2  PHOENIX             -0,00076092     0,00014      -5,40164
  3  CHEVROLET           -0,00149605     0,00014     -10,88759
  4  FORD                 0,00042717     0,00014       3,12193
 10  LOG MILES            0,00233019     0,00020      11,86928
  5  HOUS X CHEV          0,00016086     0,00019       0,82528
  6  HOUS X FORD          0,00036017     0,00019       1,86017
  7  PHOE X CHEV          0,00011222     0,00019       0,57666
  8  PHOE X FORD          0,00019474     0,00019       1,00606

DVAR                        SE DVAR      SD DVAR        R DVAR   R-SQUARED
 16  CE CO                0,65494871     0,77134       0,53674     0,29

IVAR                    COEFFICIENT     SD COEFF          T
  0                      -1,13717842     0,19932      -5,70539
  1  HOUSTON              0,08559605     0,03464       2,47089
  2  PHOENIX             -0,03953718     0,03465      -1,14088
  3  CHEVROLET           -0,16272193     0,03472      -4,68719
  4  FORD                -0,12337750     0,03457      -3,56896
 10  LOG MILES            0,68146926     0,04960      13,73921
  5  HOUS X CHEV          0,03546775     0,04922       0,72065
  6  HOUS X FORD         -0,08150649     0,04892      -1,66617
  7  PHOE X CHEV          0,11385155     0,04916       2,31574
  8  PHOE X FORD          0,06157819     0,04891       1,25913

DVAR                        SE DVAR      SD DVAR        R DVAR   R-SQUARED
 17  CW CO                0,01657065     0,04438       0,57797     0,33

IVAR                    COEFFICIENT     SD COEFF          T
  0                      -0,08462179     0,01113      -7,60350
  1  HOUSTON              0,01365238     0,00193       7,05785
  2  PHOENIX             -0,00489002     0,00194      -2,52708
  3  CHEVROLET           -0,00765095     0,00194      -3,94690
  4  FORD                -0,00681651     0,00193      -3,53136
 10  LOG MILES            0,04079900     0,00277      14,73125
  5  HOUS X CHEV          0,00313212     0,00275       1,13973
  6  HOUS X FORD         -0,00343632     0,00273      -1,25804
  7  PHOE X CHEV          0,00429422     0,00275       1,56426
  8  PHOE X FORD          0,00528781     0,00273       1,93530
```

TABLE 7b -- FULL DATA SET

Cities, car makes, interactions and log miles as covariates.

```
DVAR                        SE DVAR         SD DVAR        R DVAR   R-SQUARED
 18   CE NOX             451,43798828     572,69702       0,62166     0,39

IVAR                      COEFFICIENT     SD COEFF          T
  0                    1511,23657227     137,38335      11,00016
  1   HOUSTON            32,44606018      23,87819       1,35882
  2   PHOENIX            57,34457375      23,88669       2,40280
  3   CHEVROLET        -421,53320312      23,92899     -17,61600
  4   FORD              117,11798096      23,82787       4,91517
 10   LOG MILES         101,90093994      34,18813       2,98059
  5   HOUS X CHEV      -142,92039490      33,92352      -4,21302
  6   HOUS X FORD       166,37689209      33,71819       4,93434
  7   PHOE X CHEV       -11,79602051      33,88754      -0,34809
  8   PHOE X FORD      -221,97731018      33,70898      -6,64444

DVAR                        SE DVAR         SD DVAR        R DVAR   R-SQUARED
 19   CW NOX               0,00185431       0,00514       0,66722     0,45

IVAR                      COEFFICIENT     SD COEFF          T
  0                        0,00909915       0,00117       7,75744
  1   HOUSTON              0,00206668       0,00020      10,13731
  2   PHOENIX              0,00011056       0,00020       0,54210
  3   CHEVROLET           -0,00347147       0,00020     -16,99182
  4   FORD                 0,00106938       0,00020       5,25651
 10   LOG MILES            0,00153954       0,00029       5,27434
  5   HOUS X CHEV         -0,00136844       0,00029      -4,72471
  6   HOUS X FORD          0,00190750       0,00029       6,62601
  7   PHOE X CHEV         -0,00018463       0,00029      -0,63814
  8   PHOE X FORD         -0,00162971       0,00029      -5,66261

DVAR                        SE DVAR         SD DVAR        R DVAR   R-SQUARED
 23   CE HC IR           672,35840620     730,65112       0,40476     0,16

IVAR                      COEFFICIENT     SD COEFF          T
  0                     666,16503906     204,61774       3,25566
  1   HOUSTON            24,50570679      35,56400       0,68906
  2   PHOENIX          -209,92195129      35,57664      -5,90055
  3   CHEVROLET        -244,36896851      35,63965      -6,85610
  4   FORD              192,72845459      35,48906       5,43064
 10   LOG MILES         308,73657227      50,91356       6,06322
  5   HOUS X CHEV        -1,27635193      50,52544      -0,02526
  6   HOUS X FORD        54,32273968      50,21962       1,08170
  7   PHOE X CHEV        57,08912236      50,47136       1,12924
  8   PHOE X FORD       -17,13554138      50,20592      -0,34250

DVAR                        SE DVAR         SD DVAR        R DVAR   R-SQUARED
 24   CW HC IR             0,00165552       0,00147       0,47361     0,22

IVAR                      COEFFICIENT     SD COEFF          T
  0                        0,00052291       0,00050       1,03802
  1   HOUSTON              0,00062331       0,00009       7,11883
  2   PHOENIX             -0,00053061       0,00009      -6,74750
  3   CHEVROLET           -0,00063201       0,00009      -7,20293
  4   FORD                 0,00049481       0,00009       5,54865
 10   LOG MILES            0,00100602       0,00013       8,02508
  5   HOUS X CHEV         -0,00000509       0,00012      -0,04092
  6   HOUS X FORD          0,00027559       0,00012       2,39052
  7   PHOE X CHEV          0,00013880       0,00012       1,11691
  8   PHOE X FORD          0,00000645       0,00012       0,05220
```

[illegible]

TABLE 8c -- FULL DATA SET

Cities, car makes, interactions and log miles as covariate.

```
DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 31  LOG CE HC FI                0,08120430     0,10534       0,64280     0,41

IVAR                            COEFFICIENT     SD COEFF         T
  0                              3,22854233     0,02471     130,64461
  1  HOUSTON                     0,01151906     0,00430       2,68185
  2  PHOENIX                    -0,02032768     0,00430      -4,75421
  3  CHEVROLET                  -0,07318902     0,00430     -17,00359
  4  FORD                        0,02277989     0,00429       5,31678
 10  LOG MILES                   0,07759716     0,00615      12,61797
  5  HOUS X CHEV                 0,00573895     0,00610       0,94068
  6  HOUS X FORD                 0,00374323     0,00607       0,61716
  7  PHOE X CHEV                 0,00332901     0,00610       0,54613
  8  PHOE X FORD                -0,00031885     0,00606      -0,05258

DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 32  LOG CW HC FI                0,09575140     0,13123       0,68872     0,47

IVAR                            COEFFICIENT     SD COEFF         T
  0                             -2,52029419     0,02916     -86,49084
  1  HOUSTON                     0,06312186     0,00506      12,46325
  2  PHOENIX                    -0,02859816     0,00507      -5,64463
  3  CHEVROLET                  -0,07508063     0,00508     -14,79302
  4  FORD                        0,02431532     0,00505       4,81509
 10  LOG MILES                   0,10862323     0,00725      14,98043
  5  HOUS X CHEV                 0,01332067     0,00720       1,85128
  6  HOUS X FORD                 0,01133721     0,00715       1,58526
  7  PHOE X CHEV                -0,00529629     0,00719      -0,73658
  8  PHOE X FORD                 0,00947595     0,00715       1,32535

DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 33  LOG CE HC IR                0,07968615     0,11501       0,51103     0,26

IVAR                            COEFFICIENT     SD COEFF         T
  0                              3,01827631     0,03028      99,69395
  1  HOUSTON                     0,00931606     0,00526       1,77061
  2  PHOENIX                    -0,04182811     0,00526      -7,94615
  3  CHEVROLET                  -0,05227360     0,00527      -9,91290
  4  FORD                        0,04045162     0,00525       7,70358
 10  LOG MILES                   0,06048859     0,00753       8,02865
  5  HOUS X CHEV                -0,00217085     0,00748      -0,29038
  6  HOUS X FORD                 0,00752670     0,00743       1,01296
  7  PHOE X CHEV                 0,00937927     0,00747       1,25595
  8  PHOE X FORD                -0,00560621     0,00743      -0,75467

DVAR                              SE DVAR       SD DVAR        R DVAR   R-SQUARED
 34  LOG CW HC IR                0,10532363     0,13069       0,59728     0,36

IVAR                            COEFFICIENT     SD COEFF         T
  0                             -2,73279190     0,03205     -85,26006
  1  HOUSTON                     0,06090850     0,00557      10,93326
  2  PHOENIX                    -0,04998850     0,00557      -8,96989
  3  CHEVROLET                  -0,05416256     0,00558      -9,70167
  4  FORD                        0,04201101     0,00556       7,55703
 10  LOG MILES                   0,09208053     0,00798      11,54625
  5  HOUS X CHEV                 0,00541665     0,00791       0,68489
  6  HOUS X FORD                 0,01510808     0,00787       1,92052
  7  PHOE X CHEV                 0,00075635     0,00791       0,09567
  8  PHOE X FORD                 0,00418206     0,00786       0,53176
```

TABLE B4 -- FULL DATA SET

Cities, car makes, interactions and log miles as covariate.

```
DVAR                          SE DVAR        SD DVAR        R DVAR    R-SQUARED
 35  LOG CE NOX              0.11165452      0.13866       0.59960     0.36

IVAR                         COEFFICIENT     SD COEFF         T
  0                           3.17787116     0.03398      93.52272
  1  HOUSTON                  0.00042112     0.00591       0.07131
  2  PHOENIX                  0.01694568     0.00591       2.86813
  3  CHEVROLET               -0.10081208     0.00592     -17.03376
  4  FORD                     0.03766225     0.00589       6.39061
 10  LOG MILES                0.02102235     0.00846       2.48622
  5  HOUS X CHEV             -0.03775140     0.00839      -4.49820
  6  HOUS X FORD              0.04255297     0.00834       5.10255
  7  PHOE X CHEV             -0.00070558     0.00838      -0.08418
  8  PHOE X FORD             -0.05251047     0.00834      -6.29828

DVAR                          SE DVAR        SD DVAR        R DVAR    R-SQUARED
 36  LOG CW NOX              0.11766666      0.15717       0.64003     0.41

IVAR                         COEFFICIENT     SD COEFF         T
  0                          -2.04866791     0.03581     -57.21133
  1  HOUSTON                  0.05201864     0.00622       8.35800
  2  PHOENIX                  0.00876744     0.00623       1.40819
  3  CHEVROLET               -0.10271293     0.00624     -16.46917
  4  FORD                     0.03920987     0.00621       6.31328
 10  LOG MILES                0.05176329     0.00891       5.80986
  5  HOUS X CHEV             -0.03017768     0.00886      -3.41295
  6  HOUS X FORD              0.05016136     0.00879       5.70755
  7  PHOE X CHEV             -0.00932239     0.00883      -1.05544
  8  PHOE X FORD             -0.04272179     0.00874      -4.88737

DVAR                          SE DVAR        SD DVAR        R DVAR    R-SQUARED
 37  LOG CE CO               0.15964818      0.19019       0.55162     0.30

IVAR                         COEFFICIENT     SD COEFF         T
  0                          -0.63039109     0.04858     -12.97512
  1  HOUSTON                  0.01575830     0.00844       1.86613
  2  PHOENIX                  0.01556579     0.00845       1.84268
  3  CHEVROLET               -0.02930401     0.00846      -3.46287
  4  FORD                    -0.00841272     0.00843      -0.99835
 10  LOG MILES                0.19725263     0.01209      16.31479
  5  HOUS X CHEV              0.01377156     0.01200       1.14792
  6  HOUS X FORD             -0.02135667     0.01192      -1.79019
  7  PHOE X CHEV              0.01690001     0.01198       1.41020
  8  PHOE X FORD             -0.00811578     0.01192      -0.67947

DVAR                          SE DVAR        SD DVAR        R DVAR    R-SQUARED
 38  LOG CW CO               0.17466700      0.21654       0.59795     0.36

IVAR                         COEFFICIENT     SD COEFF         T
  0                          -2.06153578     0.05316     -38.78441
  1  HOUSTON                  0.06736638     0.00924       7.29148
  2  PHOENIX                  0.00733242     0.00924       0.79338
  3  CHEVROLET               -0.03129360     0.00926      -3.38001
  4  FORD                    -0.00695352     0.00922      -0.75489
 10  LOG MILES                0.22526962     0.01323      17.02968
  5  HOUS X CHEV              0.02121731     0.01313       1.61650
  6  HOUS X FORD             -0.01368276     0.01305      -1.04881
  7  PHOE X CHEV              0.00829636     0.01311       0.63275
  8  PHOE X FORD              0.00409368     0.01304       0.31433
```